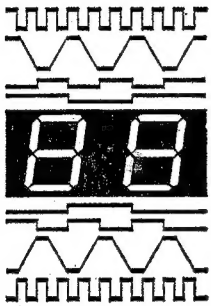


PHILIPS



Counter timer 80 MHz **PM 6622**

9446 066 220.1

Timer counter 520 MHz **PM 6624**

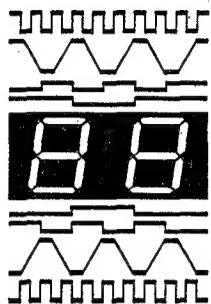
9446 066 240.1

Timer counter 1 GHz **PM 6625**

9446 066 250.1



PHILIPS



PM 6620 Series of Counters

Ordering number of this manual 9499 460 09302

780315/3



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PHILIPS



PM 6622

9446 066 220.1

Operating manual



PM 6624

9446 066 240.1



PM 6625

9446 066 250.1

IMPORTANT

In correspondence concerning this instrument, please quote the type number and the serial number as given on the type plate on the rear of the instrument.

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I. INTRODUCTION

GENERAL INFORMATION

The counters in the PM 6620-series have frequency ranges from D.C. up to 80 MHz, 520 MHz and 1 GHz respectively for the PM 6622, PM 6624 and PM 6625.

All models can measure frequency, ratio, period, time interval and have a totalizing mode.

Optional accessories such as four different oscillators, a battery unit, a BCD output unit, a D/A converter and a BUS interface system extend the range of application.

II. TECHNICAL DATA

Properties expressed in numerical values with statement of tolerances are guaranteed. Numerical values without tolerances are intended for information purposes only and indicate the properties of an average instrument. The numerical values hold good for the nominal mains voltage.

A. MEASUREMENTS

Frequency

| | |
|------------|---|
| Range | DC ... 80 MHz. Input A. All models 50 ... 520 MHz. Input C. PM 6624 50 ... 1000 MHz. Input C. PM 6625 |
| Gate times | 10 ms, 100 ms, 1 s and 10 s. Input A |
| Resolution | 100 Hz, 10 Hz, 1 Hz and 0.1 Hz. All models |
| Accuracy | ± 1 count \pm time base error |

Single Period B

| | |
|-------------------|--|
| Range | 100 ns ... 10^5 s (DC ... 10 MHz) |
| Frequency counted | 10 MHz or 10 kHz |
| Time resolution | 100 ns or 100 μ s |
| Accuracy | ± 1 count \pm trigger error* \pm time base error |

Period average B

| | |
|----------------------|---|
| Range | 1 Hz ... 10 MHz |
| Frequency counted | 10 MHz |
| Number of averagings | $N=10^2, 10^4$ and 10^6 |
| Time resolution | $\frac{100 \text{ ns}}{N}$ |
| Accuracy | ± 1 count \pm trigger error*/ N \pm time base error |

Time interval A—B

| | Single | Average |
|-------------------------------|---|---|
| Range | 100 ns ... 10^5 s | 1 ns ... 1 s |
| Frequency counted | 10 MHz or 10 kHz | 10 MHz |
| Time resolution | 100 ns or 100 μ s | $\frac{100 \text{ ns}}{\sqrt{N}}$ |
| Number of averagings | | $N=10^2, 10^4, 10^6$ |
| Min. time stop to start | | 250 ns |
| Accuracy | ± 1 count \pm trigger error** \pm time base error | ± 5 ns \pm time base error $\pm 100 \text{ ns} \pm \frac{\text{trigger error}^{**}}{\sqrt{N}}$ |
| Time interval repetition rate | max. 5 MHz | max. 4 MHz |

Count A

| | |
|-----------------------|--|
| Range | 1 to 999999999 |
| Mode | Accumulates pulses on channel A during time interval between start and stop signal or gate signal at input B |
| Pulse pair resolution | 12 ns |

Frequency ratio A/B or C/B

| | |
|------------|---|
| Range | fA: DC ... 80 MHz. All models fB: DC ... 10 MHz. All models fC: 50 ... 520 MHz. PM 6624 fC: 50 ... 1000 MHz. PM 6625 |
| Multiplier | $N = 10^4$ and 10^6 |
| Accuracy | $\pm 1 \text{ count} \pm \frac{\text{trigger error}^* \text{ of B}}{N}$ |

Check

HOLD OFF on
10 MHz internally applied to channel A and B
The hold off duration will be displayed if SINGLE PERIOD B is selected.
PM 6622.

Auxiliary functions

| | |
|---------------------------|--|
| Reset | Pushing RESET button resets the counter, releasing it starts new measurement. |
| Start/Stop and Gated by B | In function COUNT A the gate time is controlled either by start/stop or gate signal at input B. Mode of operation is selected by a slide switch at the front panel. |
| Display time | Continuously variable between 0.2 ... 5 s and infinite of display time knob is pulled. |
| Stand by | The switch is combined with display time control. Position STAND BY keeps an oven oscillator heated. |
| Memory | Switchable by push-button MEMORY |
| Trigger hold off | Active in the time-interval and the period mode. PM 6622. |
| Range | Approximately 10 ... 500 μ s, 500 μ s ... 100 ms if control knob is pulled. Hold off time is monitored at output gate open. |

* Trigger error is $\leq \pm 3 \times 10^{-3}$ for sine wave signals with signal to noise ratio of ≥ 40 dB.

** Trigger error for any wave shape is $\leq \pm \frac{2.5 \times 10^{-3}}{\text{Signal slope (V/ns)}} \text{ ns}$

B. INPUT CHARACTERISTICS**Input A and B**

| | |
|-------------------------|---|
| Range | DC ... 80 MHz |
| DC coupled | 100 Hz ... 80 MHz |
| AC coupled | } Input B is functionally limited to 10 MHz |
| Sensitivity | |
| | Sine wave: 20 mV _{rms} |
| | Pulses: 60 mV _{p-p} for pulse width ≥ 6 ns |
| Impedance | 1 M Ω //25 pF |
| Coupling | DC and AC |
| Attenuation | $\times 1$ and $\times 10$ |
| Trigger level | Preset 0 V or variable between ± 2.5 V with high resolution around 0 V. |
| Safe overload | |
| Attenuation $\times 1$ | ≤ 440 Hz: 250 V DC or 230 V _{rms} |
| | > 440 Hz: falling to 12 V _{rms} at 1 MHz |
| Attenuation $\times 10$ | Max. 250 V DC or 230 V _{rms} |

Input C

(Not present in PM 6622)

Frequency range

Dynamic voltage range

Impedance

VSWR

Coupling

Attenuation

Prescaling factor

Safe overload

AM tolerance

PM 6624

50 ... 520 MHz

10 mV_{rms} ... 12 V_{rms}

(-27 dBm ... +35 dBm)

50 Ω

<2

AC

by automatic PIN diode attenuator, maximum 62 dB.

8

12 V_{rms}

98 % at 5 kHz modulation frequency

30 % at 1 MHz modulation frequency

PM 6625

50 ... 1000 MHz

10 mV_{rms} ... 12 V_{rms}

(-27 dBm ... +35 dBm)

50 Ω

<2

AC

16

12 V_{rms}

All models

D OUT/IN 10 MHz

Range

Sensitivity

Coupling

Impedance

Safe overload

External oscillator input or internal oscillator output. Selectable by a switch at the rear panel.

1 kHz ... 10 MHz

500 mV_{rms}

AC

≈ 10 kΩ

50 V_{rms}**EXT. RESET/START**

0 V ± 0.4 V applied to EXT. RESET input will reset the counter.

If DISPLAY TIME is set to position ∞ one new measurement will be initiated when the EXT. RESET is returned to > +2.4 V (max. 5.5 V) or the input is left open.

Max. 0.4 mA at 0.4 V

Input current

* Above 960 MHz, the sensitivity of the PM 6625 might drop to 14 mV_{rms} (-24 dBm) at 1 GHz**C. OUTPUT CHARACTERISTICS****D OUT/IN 10 MHz**

Output frequency

Signal level

Output impedance

Coupling

Internal oscillator output or external oscillator input. Selectable by a switch at the rear panel.

Internal oscillator frequency, 10 MHz.

≈ 1 V_{rms}, open circuit.

≈ 200 Ω, short circuit proof.

DC

GATE OPEN

Output level

< 0.4 V during main gate open

≈ 1.5 during hold off time. PM 6622

> 2.5 V during main gate closed.

Output impedance

≈ 400 Ω.

Delay

Internal delay between the signal inputs and the trigger monitor output is approximately 65 ns.

DISPLAY

9 digits.

In plane 7 segment gas discharge display with decimal point indication.

Gate lamp

Indicates that main gate is open and counting takes place.

In stand by position the Gate lamp indicates that mains or battery voltage is connected.

Unit annunciators

kHz, MHz, ms and ns.

D. GENERAL CHARACTERISTICS

| | |
|--------------------------------------|--|
| Oscillator | See Chapter VIII. |
| Supply | |
| By mains | 100 ... 130 V or 200 ... 260 V, 50 ... 400 Hz max. 20 VA depending on options. |
| By external battery | + 11.5 to 28 V approximately 8 W. |
| By internal battery option | PM 9673 |
| Environmental characteristics | |
| Temperature | |
| Operating | 0° C ... 50° C 0° C ... 40° C with battery option PM 9673. |
| Storage | —40° C ... 70° C —40° C ... 50° C with battery option PM 9673. |
| Mains interference | Below CISPR (22/3, 29/2 and 40/1) |
| Altitude | 5000 m operating 15000 m storage. |
| Shock | Meets the requirements of the IEC 68 Eb recommendations. |
| Vibration | Meets the requirements of the IEC 68 F recommendations. |
| Dimensions | |
| Width | 210 mm |
| Height | 89 mm |
| Depth | 325 mm |
| Weight | Approximately 2.8 kg. |

III. ACCESSORIES

1. Standard accessories supplied with the instrument

| | |
|---------------------------|---|
| 1 mains cable | PM 9584 Resistive mixing piece, 50 Ω , 3 BNC sockets |
| 1 manual | |
| 1 1.6 A fuse, fast action | PM 9346 Active-probe power supply |
| 1 "115 V" label | |

2. Accessories to be ordered separately

2.1. Oscillators

| |
|--|
| PM 9677 Standard oscillator |
| PM 9678 TCXO |
| PM 9679 Oven-enclosed oscillator 1×10^{-7} /month |
| PM 9690 Oven-enclosed oscillator 1.5×10^{-9} /24 h. |

2.2. Output interface units

| |
|-------------------------|
| PM 9674 BCD output unit |
| PM 9675 D/A converter |

2.3. Input interface accessories

| |
|---|
| PM 9351 Passive measuring probe 10 M Ω ,/11 pF 220 MHz, attenuation 10 \times |
| PM 9353 FET probe, 1M Ω /3.5F, 220 MHz |

2.4. Coaxial cables

| |
|--|
| PM 9074 50 Ω , BNC to BNC, length 1 m |
| PM 9588 Set of 50 Ω cables, BNC to BNC: |
| 5 cables, length 20.7 cm |
| 4 cables, length 40.5 cm |
| 3 cables, length 60.3 cm |
| 3 cables, length 198.6 cm |

2.5. Mains cable

| |
|---------------------------------------|
| PM 9011 3-core detachable mains cable |
|---------------------------------------|

2.6. Rack mount adapter

| |
|--------------------------------|
| PM 9669 19" rack mount adapter |
|--------------------------------|

2.7. Battery unit

| |
|-------------------------------|
| PM 9673 Internal battery unit |
|-------------------------------|

2.8. Carrying case

| |
|--|
| PM 9672 Carrying case for the instrument |
|--|

IV. INSTALLATION

1. Mains voltage conversion

The instrument can be converted into two mains voltage ranges 100—130 V and 200—260 V. The frequency range is 50 to 400 Hz. At delivery the instrument is set to the 200 to 260 V range.

When changing to the 100 to 130 V range the connections of the mains transformer should be changed as shown in figure IV-1, and the label "230 V" covered with the "115 V" label supplied.

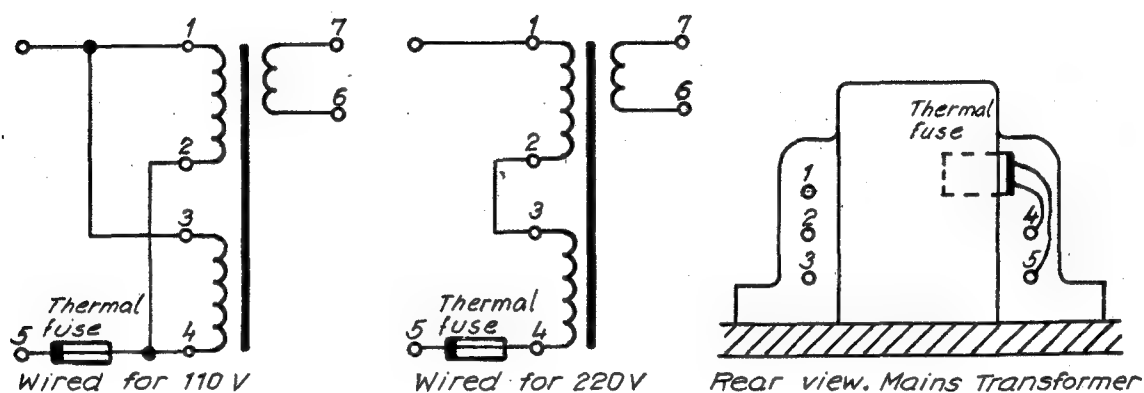


Figure IV-1. Mains transformer connections

2. Earthing

The local safety regulations prescribe how the instrument should be earthed. Two ways are possible:

1. Via the protective earth terminal at the rear panel.
2. Via the three core mains cable plugged into an outlet with protective earth contact.

NOTE: Use only one of these alternatives to avoid hum!

3. Fuses

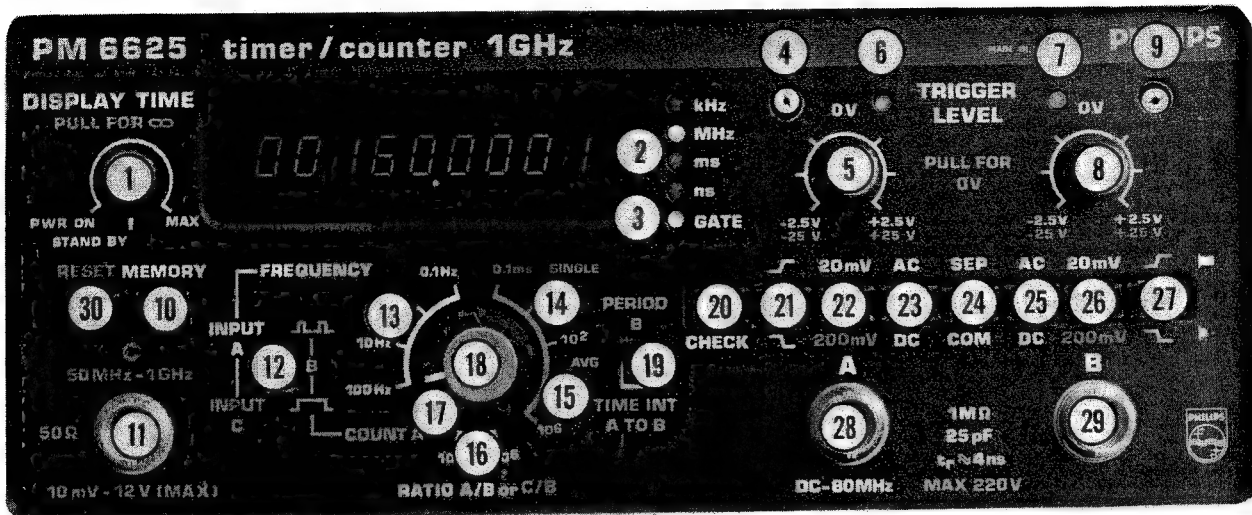
A thermal fuse on the mains transformer and a 1.6 A fuse, fast action, on unit U1 are protecting the power supply.

4. Optional accessories

Refer to installation instruction given in manual for each type number.

V. CONTROLS, INDICATORS AND CONNECTORS

Front panel PM 6624 and PM 6625



1. Display time control

Potentiometer sets display time between 0.2 s and 5 s. Infinite display time when knob is pulled. With switch set to position STAND BY the counter is turned off except of the oven oscillator.

Warning: Primary voltage of power supply is on.

2. kHz, MHz, ms and ns

Unit annunciators.

3. Gate lamp

Indicates that main-gate is opened and counting takes place, in the stand-by position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.

4. Monitor socket channel A

Output socket for set trigger level.

5. Trigger control channel A

Sets trigger level from -2.5 V to $+2.5\text{ V}$ when the attenuator is in position 20mV, and from -25 V to $+25\text{ V}$ when the attenuator is in position 200 mV. Knob pulled sets trigger level to 0 V.

6. Trigger lamp channel A

Tri-state control lamp for set trigger level. Blinking lamp indicates that the set trigger level matches the level of the input signal. Lamp permanently on indicates that the set trigger level is too high, and lamp turned off indicates that set trigger level is too low.

7. Trigger lamp channel B

Same as trigger lamp channel A.

8. Trigger control channel B

Same as trigger control channel A.

9. Monitor socket channel B

Same as monitor socket channel A.

10. Memory

In released position the measurement information is stored until next measurement cycle is completed. Depressed button makes display follow decade counters continuously.

11. Input C

Input socket for frequency and ratio measurement.

12. Start-Stop by B/Gated by B and Input A/Input C

In the upper position it sets counter to measure Count A Start-Stop by B, Frequency A, or Ratio A/B and in the lower position it sets counter to measure Count A Gated by B, Frequency C or Ratio C/B depending on how the Function Selector is set.

13. Frequency A and C

Sets counter to measure frequency at inputs A and C. 100 Hz, 10 Hz, 1 Hz and 0.1 Hz correspond to the resolution of the least significant digit.

14. Single

Sets counter to measure Single Period B or Single Time Interval A to B. Time resolution can be set to 0.1 ms or 0.1 μs .

15. Average

Sets counter to measure Multiple Period B or Time Interval Average A to B. 10^2 , 10^4 and 10^6 are number of averagings.

16. Ratio A/B or C/B

Combined with Input A/Input C switch it selects Ratio A/B or Ratio C/B measurement. 10^4 and 10^6 are multipliers.

17. Count A

Sets counter to accumulate pulses between Start to Stop or Gated by B measurements.

18. Function selector

Combined with the two slide switches it selects the different measuring modes.

19. Period B/Time Interval A to B

Sets counter to measure Period B or Time interval A to B.

20. Self check

Connects 10 MHz from the internal oscillator to the input circuits of the counter.

21. Slope selector channel A

Sets counter to trigger on either positive or negative slope of the input signal.

22. Attenuator channel A

Provides $10\times$ attenuation of the input signal.

23. AC/DC selector channel A

Selects AC or DC coupling of the input signal.

24. Separate/Common via B

Connects channel A and B internally in position COM VIA B. In position SEP the input channels are separated.

25. AC/DC selector channel B

Same as AC/DC selector channel A.

26. Attenuator channel B

Same as attenuator channel A.

27. Slope selector channel B

Same as slope selector channel A.

28. Input A

Input socket for frequency, ratio and time interval measurement.

29. Input B

Input socket for period, ratio and time interval measurement.

30. Reset

Resets counter and display to zero.

V. CONTROLS, INDICATORS AND CONNECTORS

Front panel PM 6622



1. Display time control

Potentiometer sets display time between 0.2 s and 5 s. Infinite display time when knob is pulled. With switch set to position STAND BY the counter is turned off except of the oven oscillator.

Warning: Primary voltage of power supply is on.

2. kHz, MHz, ms and ns

Unit annunciators.

3. Gate lamp

Indicates that main-gate is opened and counting takes place, in the stand-by position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.

4. Monitor socket channel A

Output socket for set trigger level.

5. Trigger control channel A

Sets trigger level from -2.5 V to $+2.5\text{ V}$ when the attenuator is in position 20mV, and from -25 V to $+25\text{ V}$ when the attenuator is in position 200 mV. Knob pulled sets trigger level to 0 V.

6. Trigger lamp channel A

Tri-state control lamp for set trigger level. Blinking lamp indicates that the set trigger level matches the level of the input signal. Lamp permanently on indicates that the set trigger level is too high, and lamp turned off indicates that set trigger level is too low.

7. Trigger lamp channel B

Same as trigger lamp channel A.

8. Trigger control channel B

Same as trigger control channel A.

9. Monitor socket channel B

Same as monitor socket channel A.

10. Memory

In released position the measurement information is stored until next measurement cycle is completed. Depressed button makes display follow decade counters continuously.

11. Hold off control

In Single Period and Single Time Interval this control disables retriggering of the main gate until the set hold off time is out.

12. Start/stop by B-Gated by B

In the upper position it sets counter to measure Count A Start-Stop by B, in the lower position counter will measure Count A Gated by B.

13. Frequency A

Sets counter to measure frequency at input A. 100 Hz, 10 Hz, 1 Hz and 0.1 Hz correspond to the resolution of the least significant digit.

14. Single

Sets counter to measure Single Period B or Single Time Interval A to B. Time resolution can be set to 0.1 ms or 0.1 μs .

15. Average

Sets counter to measure Multiple Period B or Time Interval Average A to B. 10^2 , 10^4 and 10^6 are number of averagings.

16. Ratio A/B

Sets counter to measure ratio between signals at input A and B. 10^4 and 10^6 are multipliers.

17. Count A

Sets counter to accumulate pulses between Start to Stop or Gated by B measurements.

18. Function selector

Combined with the two slide switches it selects the different measuring modes.

19. Period B/Time interval A to B

Sets counter to measure Period B or Time interval A to B.

20. Self check

Connects 10 MHz from the internal oscillator to the input circuits of the counter.

21. Slope selector channel A

Sets counter to trigger on either positive or negative slope of the input signal.

22. Attenuator channel A

Provides $10\times$ attenuation of the input signal.

23. AC/DC selector channel A

Selects AC or DC coupling of the input signal.

24. Separate/Common via B

Connects channel A and B internally in position COM VIA B. In position SEP the input channels are separated.

25. AC/DC selector channel B

Same as AC/DC selector channel A.

26. Attenuator channel B

Same as attenuator channel A.

27. Slope selector channel B

Same as slope selector channel A.

28. Input A

Input socket for frequency, ratio and time interval measurement.

29. Input B

Input socket for period, ratio and time interval measurement.

30. Reset

Resets counter and display to zero.

Rear panel PM 6622 . . . 25

**1. External battery socket**

Plus pole input socket for external battery.

2. Mains input

Input socket for the mains.

3. External reset input

Input socket for reset/start signal.

4. Monitor socket gate signal

Output socket for gate and hold off (PM 6622) signals.

5. Internal/External Standard switch

Sets operating mode of input D to either internal 10 MHz out or external 10 MHz in.

6. External battery socket

Minus pole input socket for external battery.

7. Chassis ground

Protective earth terminal.

8. Mains/Battery switch

Sets power supply to be fed from external or internal power source.

9. BCD and D/A connector

Output connector for the BCD and D/A units.

10. Internal/External Standard socket

10 MHz out or external 10 MHz in.

Top view PM 6622 . . . 25

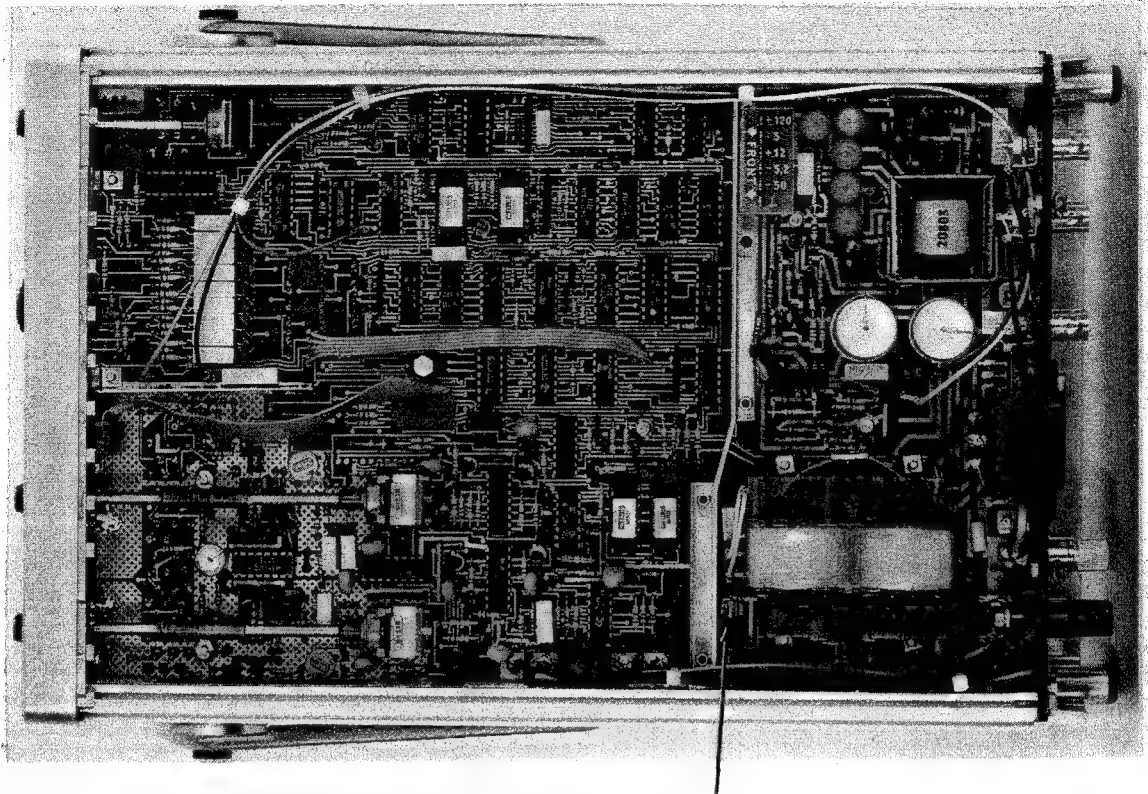


Fig. V-1. Top view of PM 6622 . . . 25

1.6 A fuse fast action.

Bottom view PM 6622 . . . 25

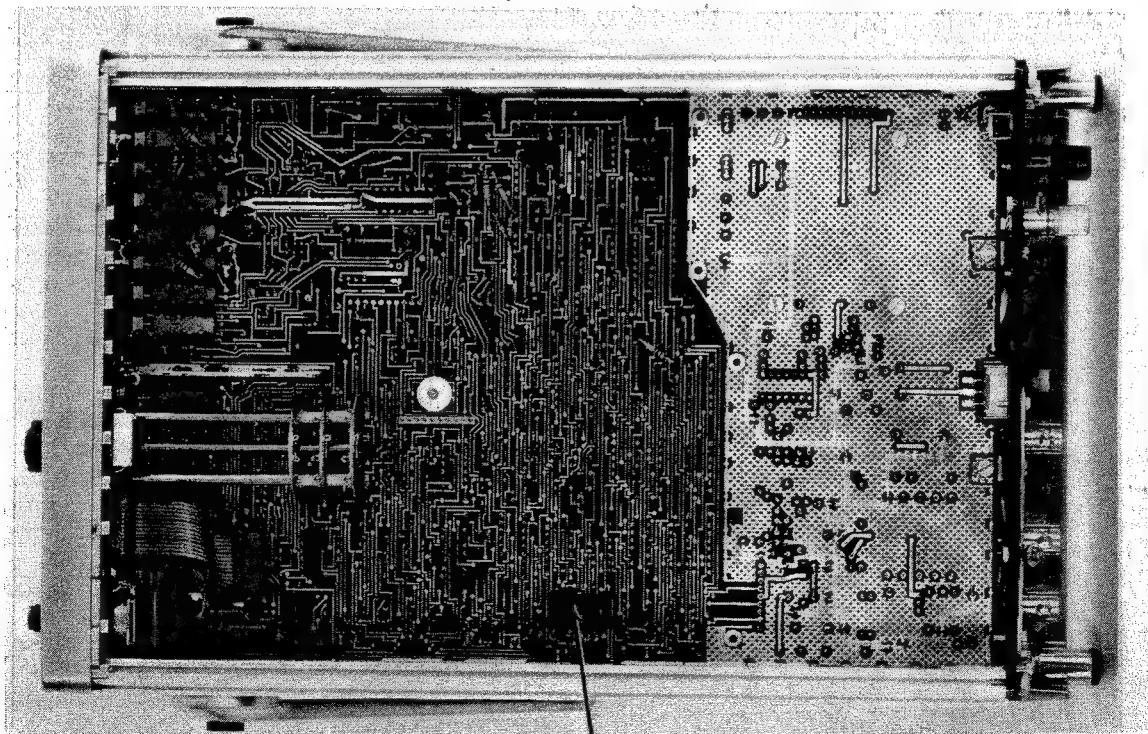


Fig. V-2. Bottom view of PM 6622 . . . 25

Connector for D/A and BCD unit.

VI. OPERATION

General Information

1. Switch on power

1.1. Mains

Before the counter is connected to the mains check that the mains transformer is wired for the local mains voltage as described in chapter IV.1. Mains voltage conversion

- Set switch MAINS EXT. BATT/INT. BATT on the rear panel to position MAINS EXT. BATT.
- Connect the mains cable to input socket for the mains at the rear panel.
- Set DISPLAY TIME control at the front panel to position ON.
- Check that display turns on indicating that power is on.

1.2. External battery

- Set switch MAINS EXT. BATT/INT. BATT at the rear panel to position MAINS EXT. BATT.
- Connect the cables from the external battery to sockets EXT. BATT. 12—28 V at the rear panel.
- Set DISPLAY TIME at the front panel control to position ON.
- Check that display turns on indicating that power is on.

1.3. Internal battery PM 9675

- Set switch MAINS EXT. BATT/INT. BATT. at the rear panel to position INT. BATT.
- Set DISPLAY TIME control at the front panel to position ON.
- Check that display turns on indicating that power is on. Blinking display indicates low voltages. Refer to manual PM 9673 for charging instructions.

2. Warm up time

The warm up time from the moment of mains connection is less than 7 minutes to an oscillator error of less than 10^{-7} for instruments equipped with the oven-enclosed oscillators PM 9679 and PM 9690. Instruments equipped with the oscillators PM 9677 or PM 9678 (TCXO) are ready for use at the moment of mains connection.

Normally the instrument is switched on from the STAND BY position. If so, no warm up time is needed, irrespective of which oscillator is employed.

3. External frequency standards

House standards or other frequency standards can be used instead of the internal 10 MHz oscillator.

If a time resolution of 100 ns is required, 10 MHz must be used. When using 1 MHz instead of 10 MHz the decimal point must be shifted one step to the left to interpret the display correctly. To set the counter to external standard the switch EXT. STD OUT VIA D/EXT. STD IN VIA D at the rear panel must be set to position EXT. STD IN VIA D.

4. Control settings

4.1. A, B and C inputs

The A and B amplifiers are identical in specification and provided with identical input controls.

The A input is normally used for frequency measurement and the B input for time measurement.

The C input is a prescaler input with automatic PIN-diode attenuator and mainly used for high frequency measurement.

4.2. AC and DC coupling

The AC/DC push-button controls the coupling of the input signal to the attenuator and the amplifier by switching a capacitor in series in the AC mode and by direct coupling in the DC mode.

A.C. coupling is normally used to block the d.c. component in signals which are superimposed on a d.c. voltage. The capacitor in series will, however, cause a falling sensitivity for low frequencies.

In waveforms where pulse width and repetition time vary the d.c. level will also vary. Change in the d.c. level will cause changes in the preset triggering level and make accurate time measurements impossible if A.C. coupled, in such cases the input should be D.C. coupled.

Normally frequency measurements are performed with an A.C. coupled input and time interval measurements with a D.C. coupled input.

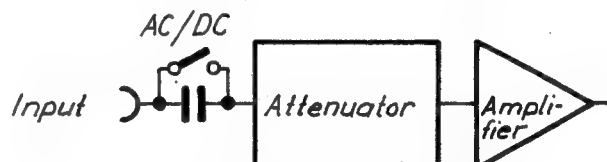


Fig. VI-1. AC/DC coupling

4.3. Attenuator and Trigger Level.

The TRIGGER LEVEL control allows continuous setting of the trigger level at any point of the input signal. For high amplitude signals the attenuator is used to expand the setting range.

However, input attenuation will decrease the sensitivity and cause bigger trigger errors.

For frequency measurements on sine wave and other symmetrical signals no level off-set is required. Pulled position of the TRIGGER LEVEL control sets the trigger level to 0 V for highest sensitivity.

However, for frequency measurement on narrow pulses a limited off-set voltage may be needed to obtain reliable triggering.

Time measurement requires continuously variable setting of the trigger level.

Monitor sockets for channel A and B provide the ability to measure the set trigger level.

If the attenuator is set to 200 mV the trigger level range is increased 10 times from ± 2.5 V to ± 25 V.

The name trigger level can be misleading, since triggering does not occur on the set trigger level but at the trigger point—see figure VI-2.

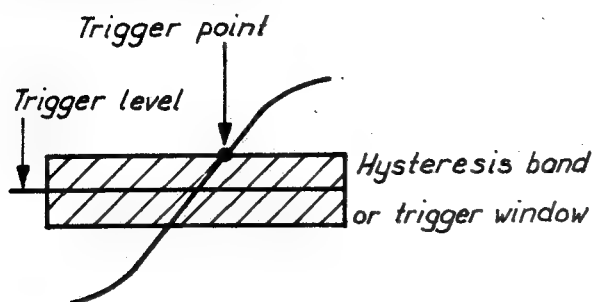


Fig. VI-2. Triggering

4.4. Separate and Common via B mode

In the SEP position the A and B inputs operate independently of each other in any operations irrespective of input sources. In the COM position the A input is disconnected from its attenuator and amplifier, and a signal connected to input B is coupled to both A and B attenuators and amplifiers.

All input specifications of input B will remain the same but the input impedance will be 500 k Ω shunted by 50 pF.

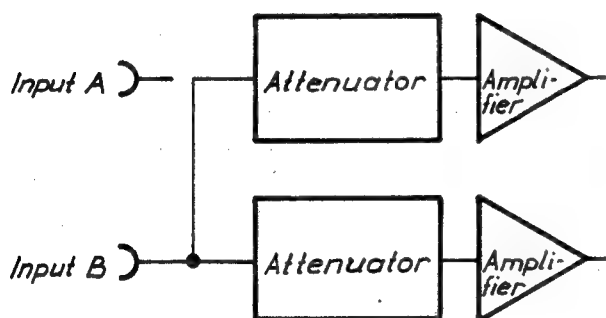


Fig. VI-3. COM via B mode

4.5. Positive and negative slope triggering

This push-button determines on which slope of the input signal the triggering will occur.

In released position the triggering will occur at the positive slope of the input signal and in depressed position it will occur on the negative slope.

Where on the slope the triggering will occur is determined by the TRIGGER LEVEL control.



Fig. VI-4. Positive and negative slope triggering

A simple way to measure the pulse width of a positive pulse is achieved by setting input A to positive slope and input B to negative slope, connect the pulse to input B, set FUNCTION SELECTOR to any of the two SINGLE positions, slide switch PERIOD B/TIME INT. A TO B to position TIME INT. A TO B and SEP/COM to COM.

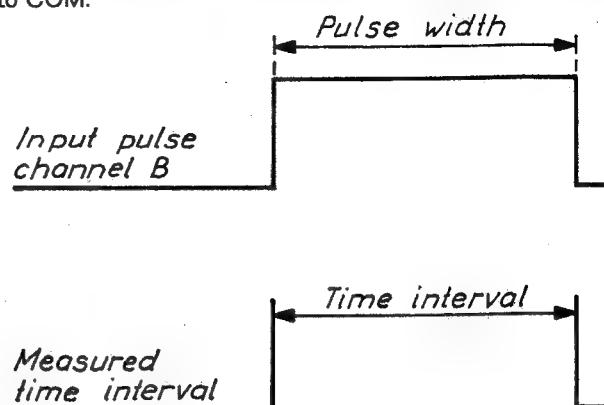


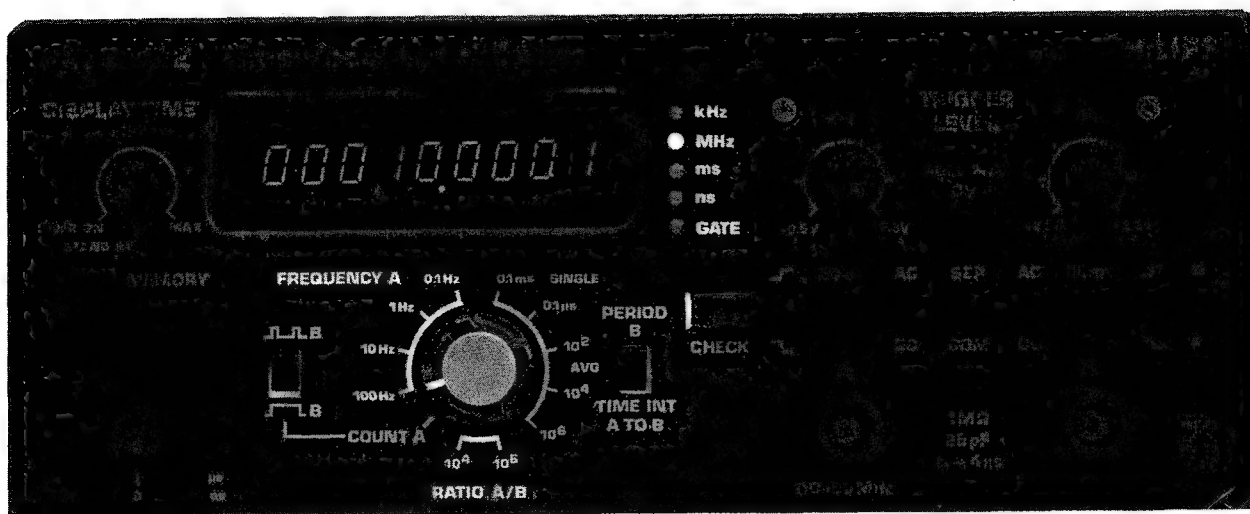
Fig. VI-5. Simple pulse width measurement

4.6. Hold off PM 6622

This control provides a delayed triggering of the instrument in single period and time interval measurement, this feature is used to avoid false triggering on noisy signals.

5. Basic measurements

5.1. CHECK PM 6622



Self check of the instrument.

- Depress CHECK push-button
- Rotate FUNCTION SELECTOR and read:

Frequency A

| | |
|--------|------------|
| 100 Hz | 00010.0000 |
| 10 Hz | 0010.00000 |
| 1 Hz | 010.000000 |
| 0.1 Hz | 10.0000000 |

— Set PERIOD B/TIME INT A TO B to PERIOD B

Period B

| | |
|-----------------|------------|
| 0.1 ms | 00000000.0 |
| 0.1 ns | 00000.0001 |
| 10 ² | 000000100 |
| 10 ⁴ | 0000100.00 |
| 10 ⁶ | 00100.0000 |

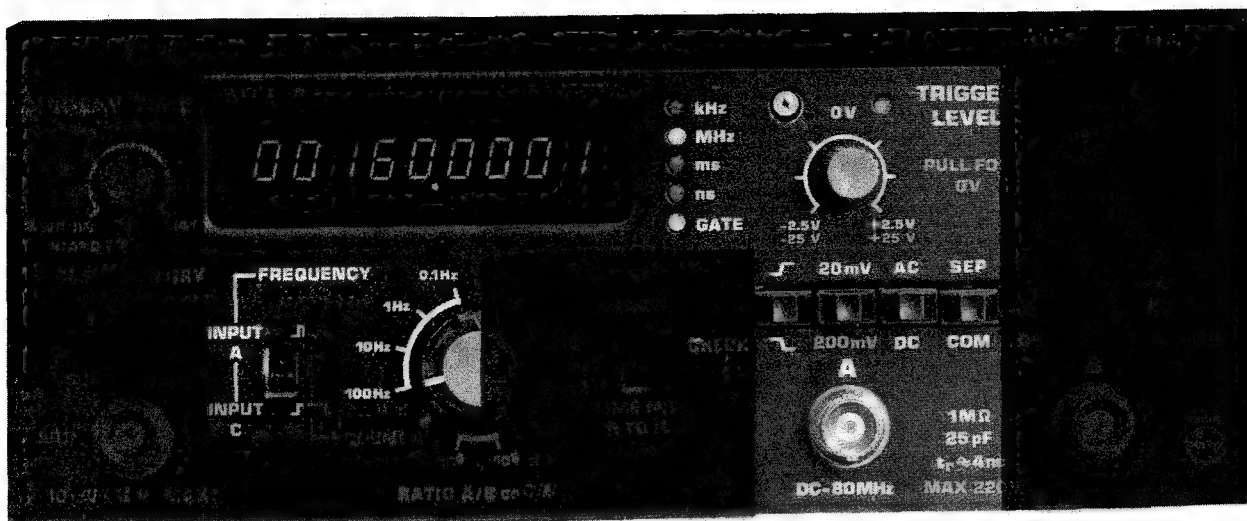
Ratio A/B

| | |
|-----------------|------------|
| 10 ⁶ | 001.000000 |
| 10 ⁴ | 00001.0000 |

Count A

| | |
|------------|-----------|
| Start/Stop | 000000002 |
| Gated | 000000001 |

5.3. Frequency A. PM 6622 ... 25

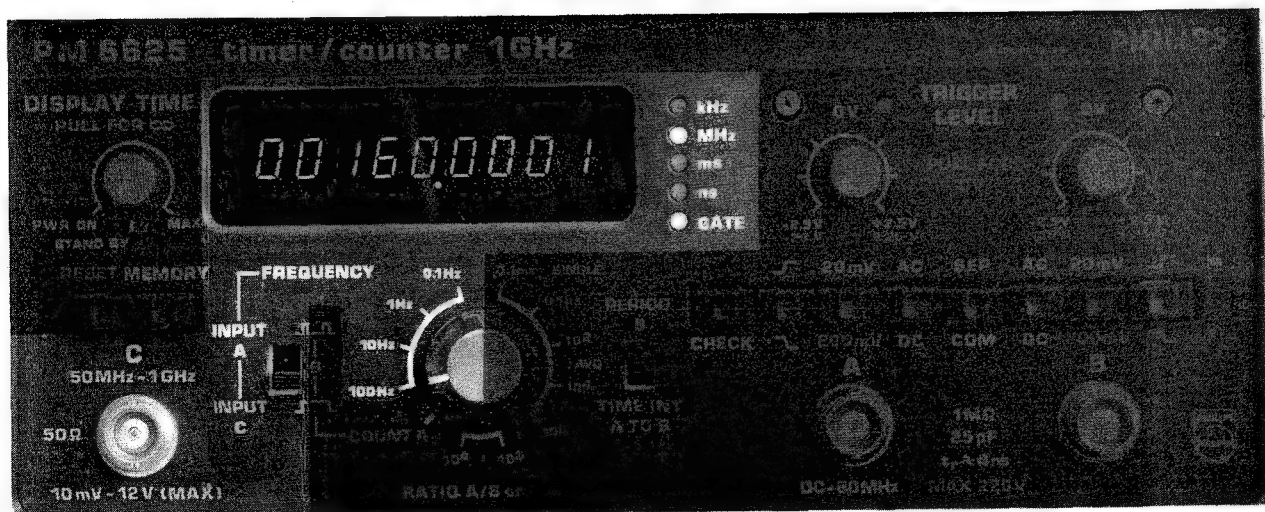


Simple frequency measurement on sine waves and other symmetrical waveforms.

- Set FUNCTION SELECTOR to desired resolution
- Set INPUT A/INPUT C to INPUT A (only PM 6624 ... 25)
- Set AC/DC to AC

- Pull TRIGGER LEVEL control
 - Set SEP/COM to SEP
 - Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than $1 V_{rms}$
 - Connect the input signal to input A
- Display will show frequency in kHz or MHz

5.4. FREQUENCY C PM 6624 ... 25



Automatic frequency measurement.

- Set FUNCTION SELECTOR to desired resolution
 - Set INPUT A/INPUT C to INPUT C
 - Connect the input signal to input C
- Display will show frequency in MHz or kHz

5.5. PERIOD B PM 6622 . . . 25



Simple period measurement on sine waves and other symmetrical waveforms.

- Set FUNCTION SELECTOR to SINGLE or AVG measurement
- Set PERIOD B/TIME INT A TO B to PERIOD B
- Pull TRIGGER LEVEL

- Set AC/DC to AC
 - Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1 V_{rms}
 - Select positive slope triggering
 - Connect the signal to input B
- Display will show period time in ms or ns

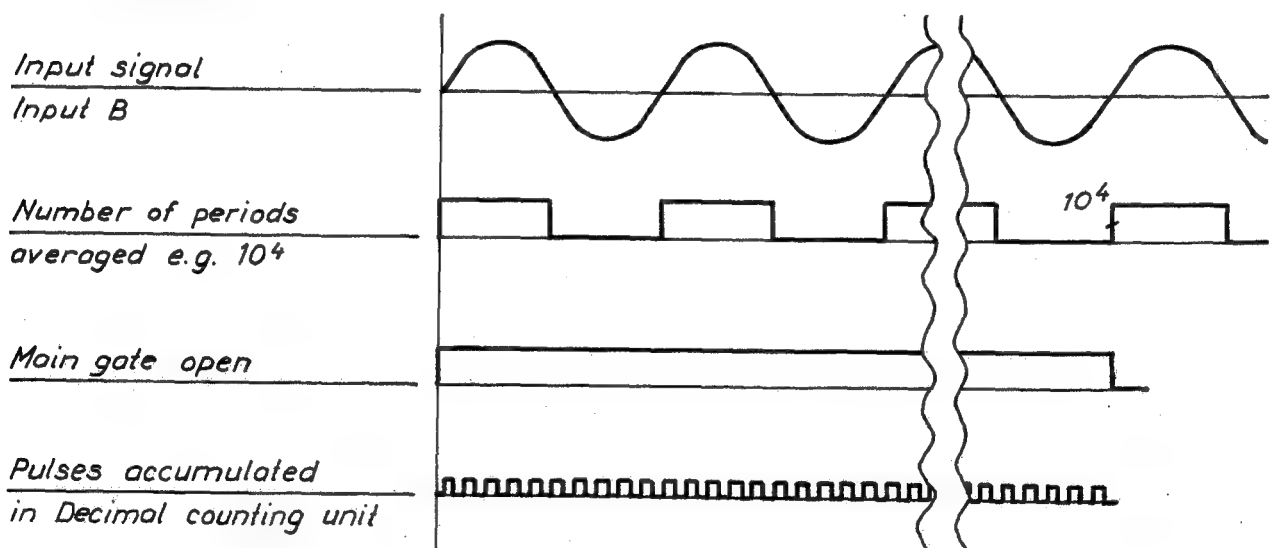


Fig. VI-6. Period average measurement

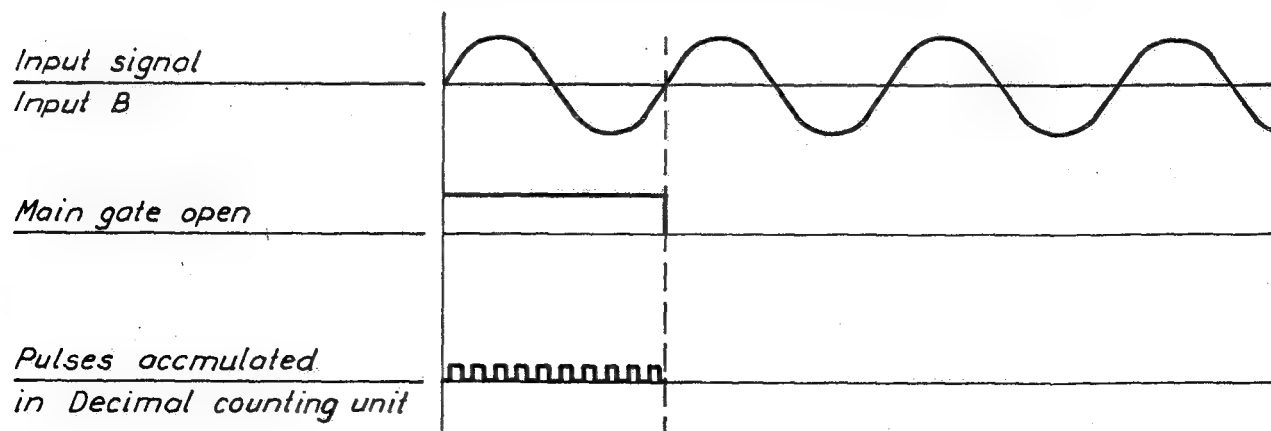
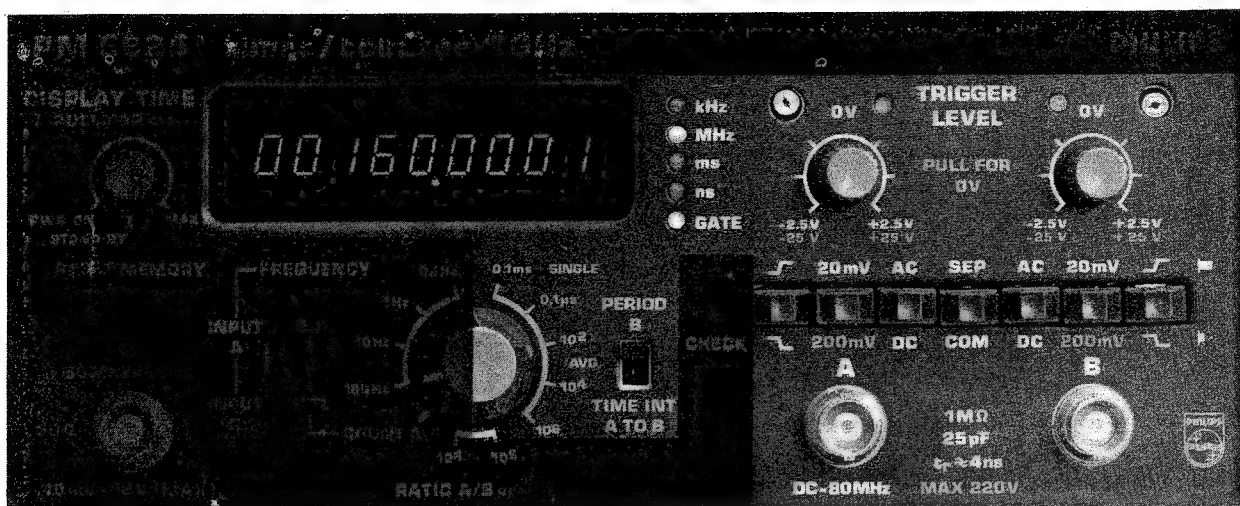


Fig. VI-7. Single period measurement

5.6. Time Interval A to B PM 6622 ... 25



Simple measurement of time interval between pulses at input A and B from separate sources.

- Set FUNCTION SELECTOR to SINGLE or AVG
- Set PERIOD B/TIME INT A TO B to TIME INT A TO B
- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than $3 V_{p-p}$

- Set AC/DC to DC
 - Set SEP/COM to SEP
 - Select positive slope triggering
 - Set TRIGGER LEVEL potentiometer to suitable trigger level e.g. 50 % of the pulse amplitude
 - Connect the pulses to input A and B
- Display will show the time interval in ms or ns

5.7. Ratio A/B PM 6622 ... 25



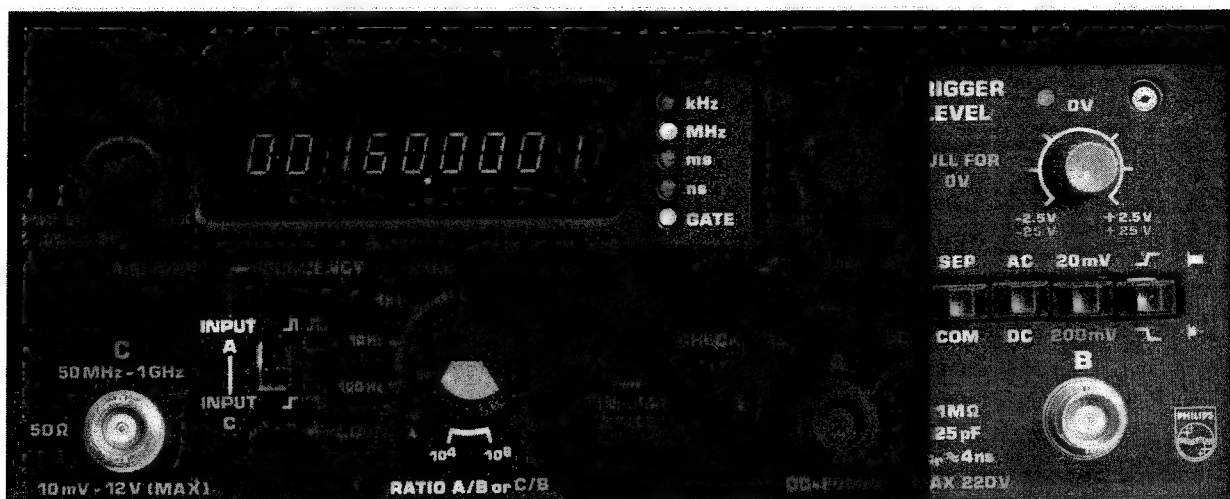
Simple ratio measurement on sine wave or other symmetrical waveforms.

- Set FUNCTION SELECTOR to 10^4 or 10^6
- Pull TRIGGER LEVEL control
- Set AC/DC to AC
- Set SEP/COM to SEP

- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than $1 V_{rms}$
- Connect the signal with the highest frequency to input A and the other signal to input B

Display will show the ratio of the signal frequencies at input A and B

5.8. Ratio C/B PM 6624 ... 25



Simple ratio measurement on sine wave and other symmetrical waveforms.

- Set FUNCTION SELECTOR to 10^4 or 10^6
- Set INPUT A/INPUT C to INPUT C
- Pull TRIGGER LEVEL control
- Set SEP/COM to SEP

- Set AC/DC to AC
 - Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than $1 V_{rms}$
 - Connect the signal with the highest frequency to input C and the other to input B.
- Display will show the ratio of the signal frequencies at input C and B

5.9. Count A Start/Stop and Gated by B. PM 6622 . . . 25



Simple Start/Stop and Gated by B measurement on sine wave and other symmetrical waveforms.

- Set FUNCTION SELECTOR to COUNT A
- Pull TRIGGER LEVEL Control
- Set AC/DC to AC for channel A
- Set AC/DC to DC for channel B
- Set SEP/COM to SEP
- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than $1 V_{rms}$

- Select positive slope triggering
- Select Start/Stop by B (upper position) or Gated by B (lower position)
- Connect gating signal to input B and the other signal to input A

In Start/Stop operation the display will show the accumulated number of counts in the time interval between the Start/Stop signals, and in the Gated mode the accumulated number of counts during the positive and negative slopes of the Gating signal

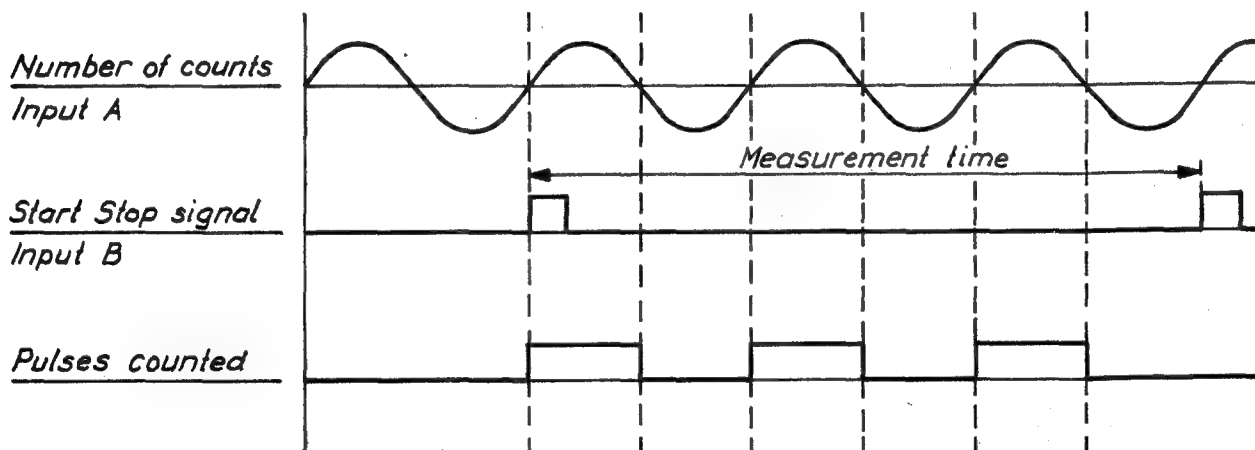


Fig. VI-8. Start/Stop by B measurement

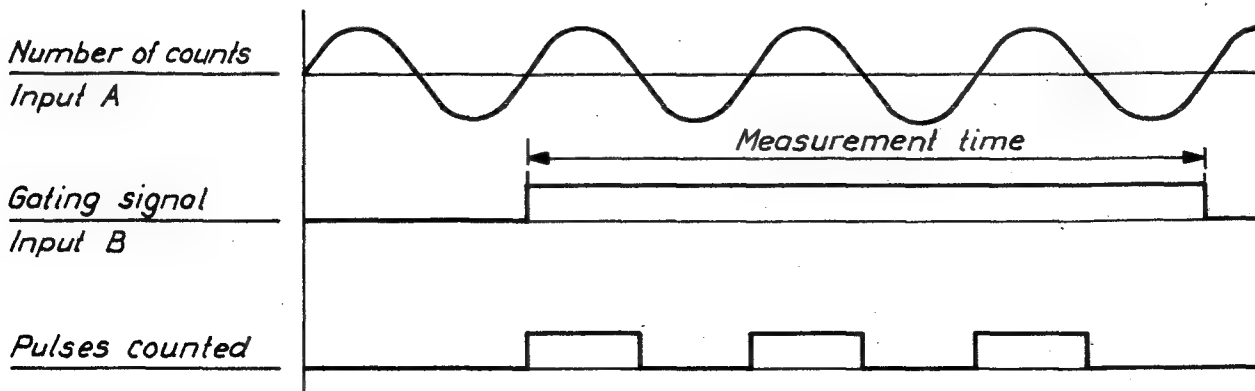


Fig. VI-9. Gated by B measurement

5.10. Hold off PM 6622



— Set FUNCTION SELECTOR to 0.1 μ s and rotate HOLD OFF control from fully CCW to fully CW position

— Read hold off time from 0.01 to 0.5 ms on the display with knob pushed and 0.5 ms to 100 ms with knob pulled

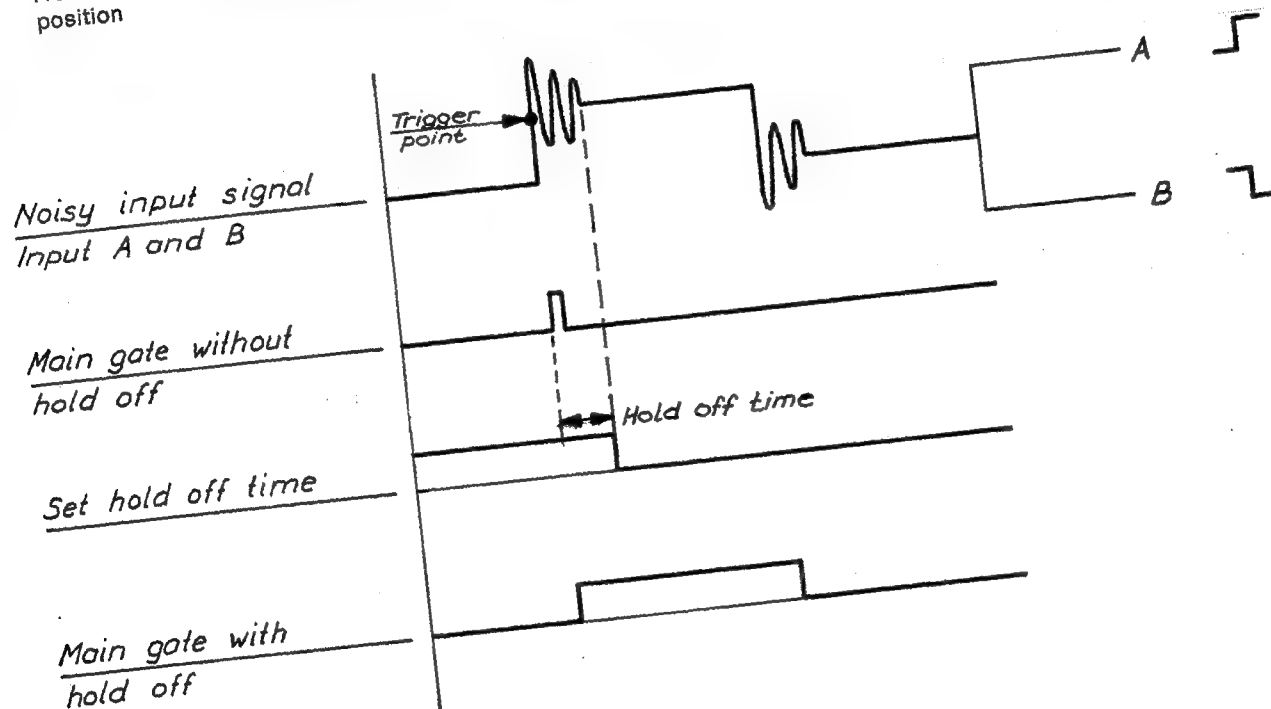


Fig. VI-10. Time interval measurement on noisy signals

VII. INTERNAL CHECKS AND ADJUSTMENTS

The tolerances mentioned in the following text apply to newly adjusted instruments only. The value may differ from those given in Chapter II Technical data.

Note: Always check the d.c. supply voltages before any adjustments are made.

1. Use figure X-2 to identify the location of trimmers and check points.

2. Test equipment

| Check point | Instrument | Required data | Recommended model |
|-------------|-----------------|--|-------------------------------|
| 3 | Voltmeter | 5—150 V d.c. | Philips PM 2412 |
| 4 6 | Voltmeter | 1 V d.c. | Philips PM 2412 |
| 5 8 | Pulse generator | Frequency 10 kHz Amplitude 1 V Duty factor 0.5 | Philips PM 5715 or PM 5705 |
| 5 8 | Oscilloscope | Low frequency | Philips PM 3250 |
| 5 8 | Probe | Passive 10 M Ω /11 pF | Philips PM 9336 |

3. D.C. voltages

3.1 Connect the voltmeter to jumper connector BU 104 and check the d.c. voltages according to table below.

| Test point | Measured voltage |
|------------|------------------|
| +120 | 115 ... 130 V |
| +5.2 | 4.8 ... 5.2 V |
| +12 | 11.5 ... 13 V |
| —5.2 | —5 ... —5.4 V |
| —50 | —50 ... —60 V |

4. D.C. balance channel A.

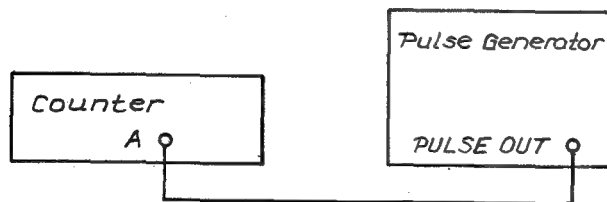
4.1 Disconnect all input signals, release all push-buttons and set the controls of the counter:

| | |
|-------------------|----------------|
| Start/Stop | upper position |
| Trigg. level pot. | pulled |

4.2 Connect the voltmeter to terminal 6 of IC 101 and adjust R 1104 until voltmeter shows 0 V.

5. Frequency compensation channel A

Test set up.



5.1 Set the controls of the counter:

| | |
|------------|-----------------|
| Attenuator | 200 mV position |
|------------|-----------------|

5.2 Set the controls of the pulse generator:

| | |
|-------------|--------------------|
| Frequency | 10 kHz |
| Amplitude | 3 V _{p-p} |
| Duty factor | 0.5 |

5.3 Connect the oscilloscope via a well adjusted 10 M Ω /11 pF probe to terminal 6 of IC 101 and adjust C 102 to minimum distortion of the displayed wave-form.

6. D.C. balance channel B

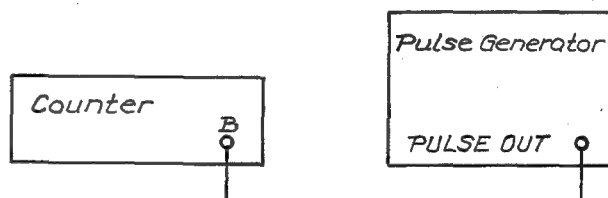
6.1 Disconnect all input signals, release all push-buttons and set the controls of the counter:

| | |
|------------------|----------------|
| Start/Stop | upper position |
| Trigg.level pot. | pulled |

6.2 Connect the voltmeter to terminal 12 of IC 101 and adjust R 1044 until voltmeter shows zero.

7. Frequency compensation channel B

Test set up.



7.1 Set the controls of the counter:

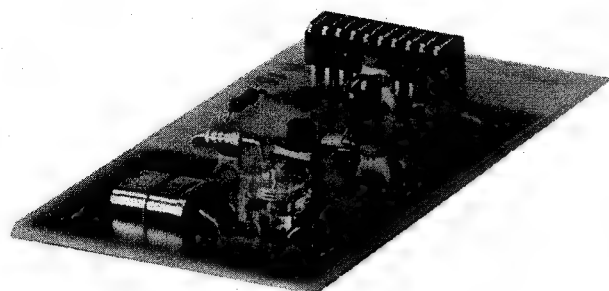
| | |
|------------|-----------------|
| Attenuator | 200 mV position |
|------------|-----------------|

7.2 Set the controls of the pulse generator:

| | |
|-------------|--------------------|
| Frequency | 10 kHz |
| Amplitude | 3 V _{p-p} |
| Duty factor | 0.5 |

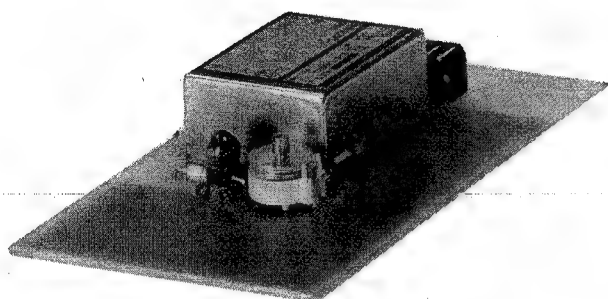
7.3 Connect the oscilloscope via a well adjusted 10 M Ω /11 pF probe to terminal 12 of IC 101 and adjust C 112 to minimum distortion of the displayed wave form.

VIII. OSCILLATORS PM 9677, PM 9678, PM 9679 and PM 9690



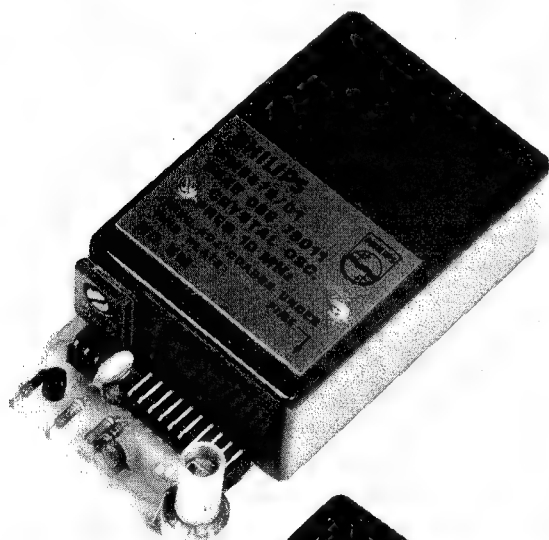
PM 9677

9446 096 770.1



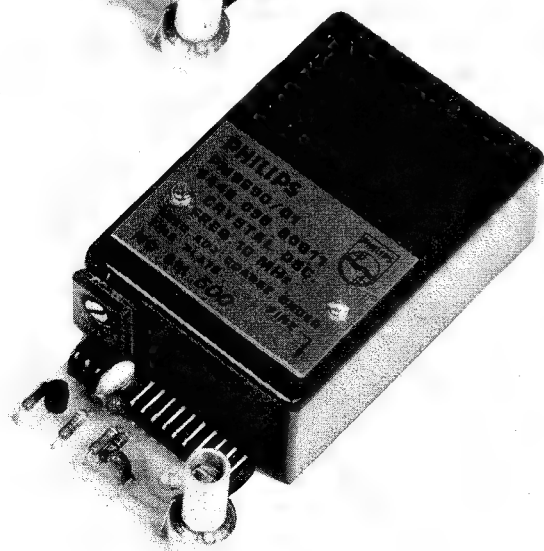
PM 9678

9446 096 780.1



PM 9679

9446 096 790.1



PM 9690

9446 096 900.1

1. General

The oscillators are made as plug-in cards and have a nominal frequency of 10 MHz.

2. Technical data

| 2.1. Electrical | PM 9677 | PM 9678 | PM 9679 | PM 9690 |
|---|---|--------------------------------|---|--|
| Nominal frequency, MHz | 10.000 000 | 10.000 000 | 10.000 000 | 10.000 000 |
| Trimming range, Hz | $> \pm 200$ | $> \pm 20$ | +20*) —30 | +3*) —7 |
| Output voltage, mV (into 1 kohm) | > 300 | > 100 | > 150 | > 50 |
| Supply voltage, V | + 12 | + 12 | + 11.5 to 28 (from unregulated power supply) | + 11.5 to 28 (from unregulated power supply) |
| Power consumption (+25°C) | | | | |
| Continuous operation | < 100 mW | < 200 mW | < 100 mA | < 125 mA |
| Stand by | none | none | < 100 mA | < 125 mA |
| Warm up | none | none | < 400 mA | < 400 mA |
| Stability against: | | | | |
| Ageing | $< 5 \times 10^{-7}$ /month | $< 1 \times 10^{-7}$ /month**) | $< 1 \times 10^{-7}$ /month | $< 1.5 \times 10^{-9}$ /24 h (after 72 hours of continuous operation) |
| Temperature | $< 1 \times 10^{-5}$ | $< 1 \times 10^{-6}$ | $< 1 \times 10^{-7}$ | $< 3 \times 10^{-8}$ |
| 0...50°C (ref. to +25°C) | | | | |
| Line voltage ± 10 % | $< 1 \times 10^{-8}$ | $< 1 \times 10^{-9}$ | $< 1 \times 10^{-9}$ | $< 5 \times 10^{-10}$ |
| Change of measuring mode and change between line, ext. and int. battery | $< 3 \times 10^{-7}$ | $< 5 \times 10^{-8}$ | $< 1 \times 10^{-8}$ | $< 3 \times 10^{-9}$ |
| Warm up time (to reach 1×10^{-7}) | | | < 10 min | < 15 min |
| 2.2. Environmental | | | | |
| Temperature | | | | |
| Storage, °C | —40 to +70 | —40 to +70 | —40 to +70 | —40 to +70 |
| Operating, °C | 0 to +50 | 0 to +50 | 0 to +50 | 0 to +50 |
| Altitude | | | | |
| Storage, m | 15000 | 15000 | 15000 | 15000 |
| Operating, m | 5000 | 5000 | 5000 | 5000 |
| Humidity at 50°C | 10—90 % RH (26° dew point) | 10—90 % RH (26° dew point) | 10—90 % RH (26° dew point) | 10—90 % (26° dew point) |
| Shock | Meets the requirement of the IEC Eb recommendations Meets the requirement of the IEC 68F recommendations | | | |
| Vibration | | | | |
| 2.3. Mechanical | | | | |
| Dimensions, mm | 93×50×20 | 93×50×15 | 100×52×35 | 100×52×35 |
| Weight, g | 50 | 25 | 100 | 100 |

*) The indicated values regard only the fine trimming range. A coarse trimmer is available on the PM 9679 and PM 9690 to adjust for an ageing of more than 10 years.

**) Trimming range will cover at least 10 years of operation since the ageing will decrease substantially after the first 6 months.

3. Frequency adjustment PM 9677

- 3.1. This adjustment requires a reference oscillator having an accuracy of $\leq 1 \times 10^{-6}$.
The oven enclosed PHILIPS oscillators PM 9680*, PM 9681* and PM 9690* meet this requirement.
The adjustment should preferably be made at an ambient temperature of $+25^\circ\text{C}$.
- 3.2. Remove the bottom cover of the counter.
- 3.3. Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.
- 3.4. Set the controls of the counter to be adjusted:
FUNCTION SELECTOR: FREQUENCY A 1 Hz
TRIGGER LEVEL A: pulled
- 3.5. Adjust trimming capacitor C 1 to 10000.000 kHz plus or minus 10 Hz.

4. Frequency adjustment PM 9678

- 4.1. This adjustment requires a reference oscillator having an accuracy of $\leq 1 \times 10^{-7}$.
The oven enclosed PHILIPS oscillator PM 9680*, PM 9681* and PM 9690* meet this requirement.
The adjustment should preferably be made at an ambient temperature of $+25^\circ\text{C}$.
- 4.2. Remove the bottom cover of the counter.
- 4.3. Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.
- 4.4. Set the controls of the counter to be adjusted:
FUNCTION SELECTOR: FREQUENCY A 1 Hz
TRIGGER LEVEL: pulled
- 4.5. Adjust trimming capacitor C 1 to 10000.000 kHz plus or minus 1 Hz.
- 4.6. Set FUNCTION SELECTOR to position 0.1 Hz and check that display read out is the same as before. If not, adjust C1 slightly to correct frequency.

5. Frequency adjustment PM 9679

- 5.1. This adjustment requires a reference oscillator having an accuracy of $\leq 3 \times 10^{-8}$.
The oven enclosed PHILIPS oscillators PM 9680*, PM 9681* and PM 9690* meet this requirement.
The adjustment should preferably be made at an ambient temperature of 25°C and the oscillator must have been operating continuously 72 h before any adjustment is made.
- 5.2. Remove the bottom cover of the counter.
- 5.3. Connect the reference signal available at socket 10 MHz OUT of the external counter to socket EXT. TRIGG of oscilloscope PHILIPS PM 3250 or PM 3400.
- 5.4. Connect the oscillator signal available at socket 10 MHz OUT of the counter to be adjusted to INPUT A of the oscilloscope.
- 5.5. Set oscilloscope to 100 ns/div and adjust trimming potentiometer R 208 until waveform moves with a velocity of maximum 1 div./3 s (0.3 Hz).
If the adjustment range of R 208 is too narrow perform the following steps 5.6 to 5.12.
- 5.6. Set trimming potentiometer R 208 to fully clockwise position.
- 5.7. Remove the two screws fixing the oscillator's text plate to the box.
- 5.8. Remove the small plastic cylinder beneath the text plate using a pair of tweezers.
- 5.9. Connect an external counter to socket 10 MHz OUT at the rear panel of the counter to be adjusted.
- 5.10. Adjust trimming capacitor C 108 until the display

read out of the external counter is 10000020 Hz.
5.11. Refit the plastic cylinder and the text plate.
5.12. Perform steps 5.3 to 5.5.

6. Frequency adjustment PM 9690

- 6.1. This adjustment requires a reference frequency having an accuracy of $\leq 1 \times 10^{-9}$.
Hewlett-Packard quartz frequency standard HP 105* meets this requirement.
The adjustment should preferably be made at an ambient temperature of 25°C and the oscillator must have been operating continuously 72 h before any adjustment is made.
- 6.2. Remove the bottom cover of the counter.
- 6.3. Connect any of the three reference signals available at sockets 5 MHz, 1 MHz and 100 kHz of the HP 105 to socket EXT. TRIGG of oscilloscope PHILIPS PM 3250 or PM 3400.
- 6.4. Connect the oscillator signal available at socket 10 MHz OUT of the counter to be adjusted to INPUT A of the oscilloscope.
- 6.5. Set oscilloscope to 100 ns/div and adjust trimming potentiometer R 208 until waveform moves with a velocity of maximum 1 div/10 s (0.1 Hz).
If the adjustment range of R 208 is too narrow perform the following steps 6.6 to 6.12.
- 6.6. Set trimming potentiometer R 208 to fully clockwise position.
- 6.7. Remove the two screws fixing the oscillator's text plate to the box.
- 6.8. Remove the small plastic cylinder beneath the text plate using a pair of tweezers.
- 6.9. Connect an external counter to socket 10 MHz OUT at the rear panel of the counter to be adjusted.
- 6.10. Adjust trimming capacitor C 108 until the display read out of the external counter is 10000003 Hz.
- 6.11. Refit the plastic cylinder and the text plate.
- 6.12. Perform steps 6.3 to 6.5.

7. Repair of oscillator PM 9679 and PM 9690

7.1. Repair of these oscillators may not be carried out by the local service organisations. In case of breakdown the complete sealed oscillator box has to be sent to the factory for repair.

Factory address:

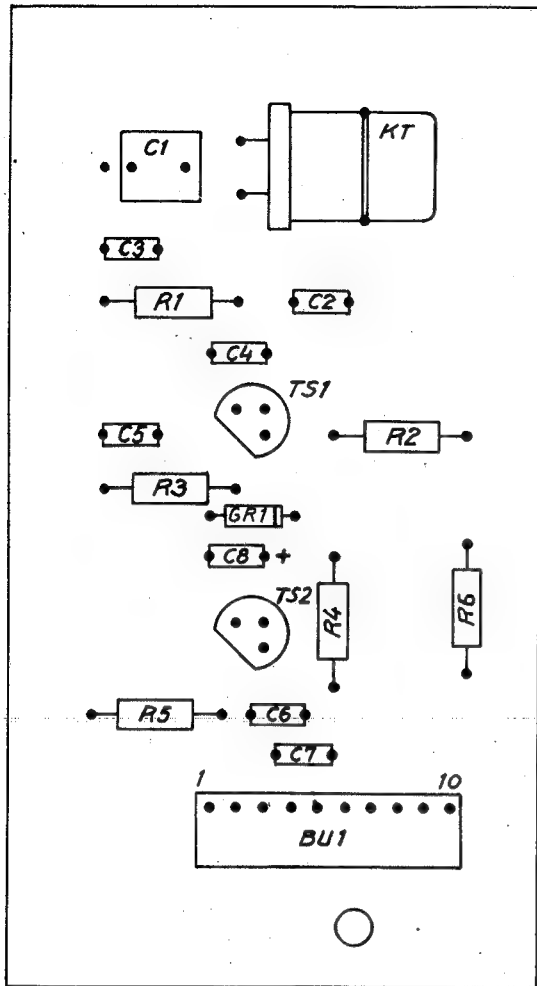
PHILIPS ELEKTRONIKINDUSTRIER AB
INDUSTRIAL OPERATIONS
FACK
S-175 20 JÄRFÄLLA
SWEDEN

8. Pin configuration

| | PM 9677 | PM 9678 | PM 9679 | PM 9690 |
|-----|------------|------------|----------------|------------|
| Pin | | | | |
| 1 | ⊥ | ⊥ | ⊥ | ⊥ |
| 2 | ⊥ | ⊥ | ⊥ | ⊥ |
| 3 | ⊥ | ⊥ | ⊥ | ⊥ |
| 4 | | | + 11.5 to 28 V | |
| 5 | 10 MHz out | 10 MHz out | 10 MHz out | 10 MHz out |
| 7 | + 12 V | + 12 V | | |

*To be checked against a frequency standard such as Droitwich or HBG.

9. Circuit diagram, component lay-out and spare parts list PM 9677



| | | |
|------|-----|-------|
| 4822 | 110 | 63161 |
| 4822 | 110 | 63116 |
| 4822 | 110 | 63107 |
| 4822 | 110 | 63107 |
| 4822 | 110 | 63107 |
| 4822 | 110 | 63107 |

| | | |
|------|-----|-------|
| 5322 | 125 | 54029 |
| 4822 | 122 | 31063 |
| 4822 | 122 | 31072 |
| 4822 | 122 | 31076 |
| 5322 | 122 | 34041 |
| 5322 | 122 | 34041 |
| 5322 | 122 | 34041 |
| 5322 | 124 | 14036 |

| | | |
|------|-----|-------|
| 5322 | 130 | 44418 |
| 5322 | 130 | 44418 |
| 5322 | 130 | 30766 |

| | | |
|------|-----|-------|
| 5322 | 242 | 74036 |
| 5322 | 267 | 64031 |

Spare parts PM 9677

RESISTORS

| | | | |
|------|---|------|----|
| 100K | 5 | CR25 | R1 |
| 2.2K | 5 | CR25 | R2 |
| 1K | 5 | CR25 | R3 |
| 1K | 5 | CR25 | R4 |
| 1K | 5 | CR25 | R5 |
| 1K | 5 | CR25 | R6 |

CAPACITORS

| | | | |
|-------|--------|-----|----|
| 2-18P | | 300 | C1 |
| 22P | 2 | 100 | C2 |
| 47P | 2 | 100 | C3 |
| 68P | 2 | 100 | C4 |
| 10N | =20+50 | 100 | C5 |
| 10N | =20+50 | 100 | C6 |
| 10N | =20+50 | 100 | C7 |
| 15M | =10+50 | 16 | C8 |

SEMI CONDUCTORS

| | |
|------------|-----|
| BF 256 A | TS1 |
| BF 256 A | TS2 |
| BZX79-C6V2 | GR1 |

MISCELLANEOUS
CRYSTAL 10MHZ
CONNECTOR

BU1

Figure VIII-1. Component lay-out PM 9677

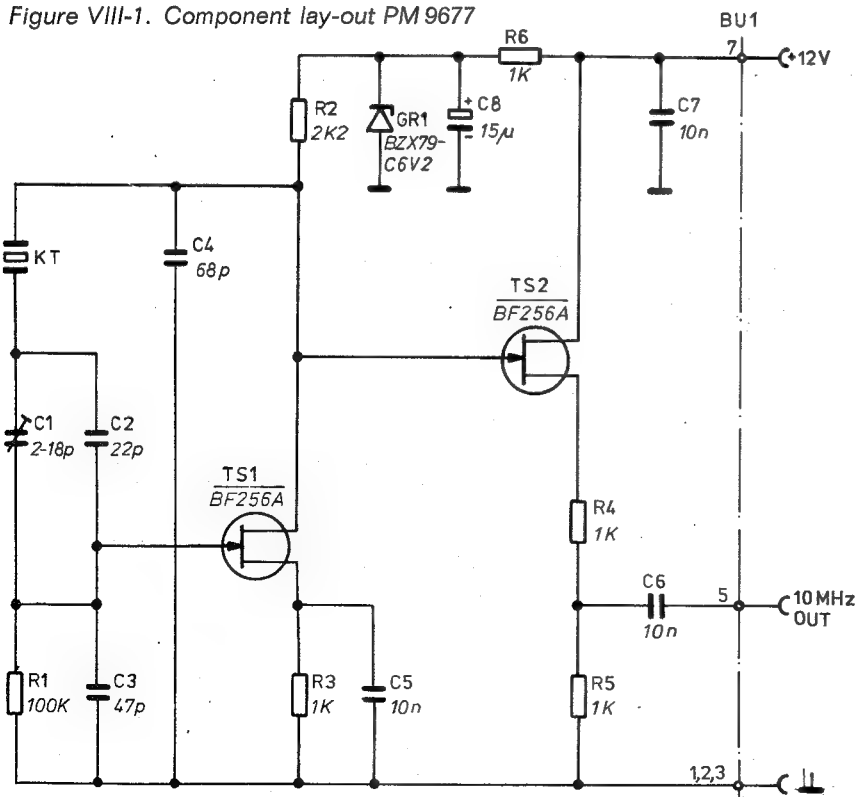


Figure VIII-2. Circuit diagram PM 9677

10. Circuit diagram, component lay-out and spare parts list PM 9678

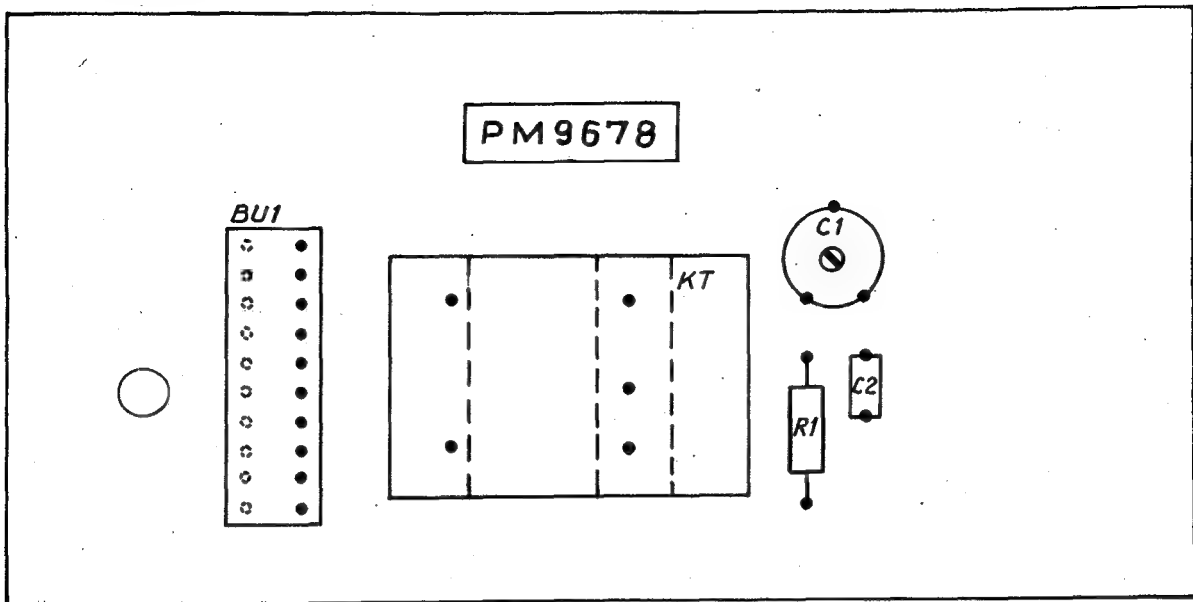


Figure VIII-3. Component lay-out PM 9678

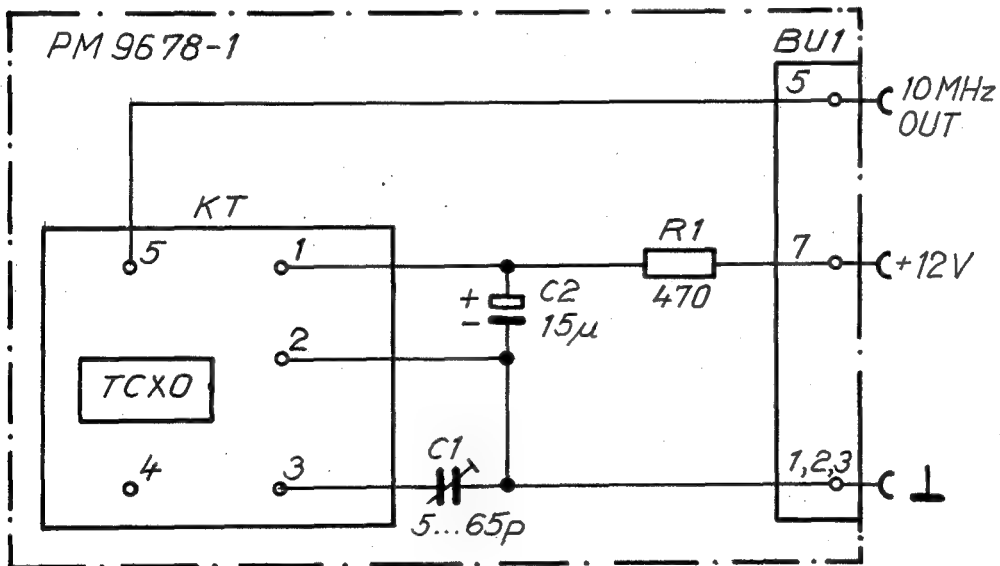


Figure VIII-4. Circuit diagram PM 9678

ORDERING NUMBER

| | | |
|----------------|---------------------|------|
| 4822 110 63098 | 470 Ω 5 % | R 1 |
| 5322 125 50057 | 5-65 P | C 1 |
| 5322 124 14036 | 15 M -10 +50 % 16 V | C 2 |
| 5322 267 64031 | Connector | BU 1 |
| 5322 216 94047 | Crystal 10 MHz | |

Spare parts PM 9678

IX. REPLACING PARTS

1. Push-button switches

1.1. Loosen switch by bending the four tags securing the switch to the switch bracket.

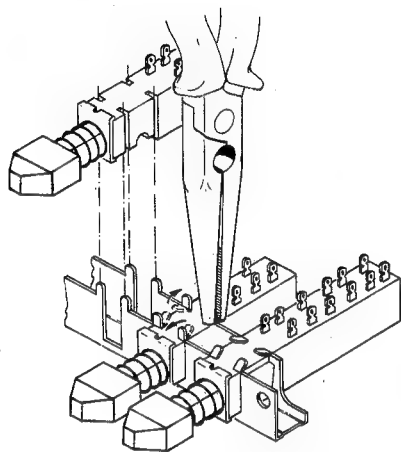


Fig. IX-1. Replacing push-button switch

1.2. Crush the switch by means of a pair of cutting pliers.

1.3. Unsolder the contact pins from the circuit board one by one. Use a sucking device to remove all tin solder from the contact holes in the circuit board before attaching the new switch.

2. Text plate and front rim

2.1. Remove the knobs for DISPLAY TIME, HOLD OFF (PM 6622), TRIGGER LEVEL and function selector.

2.2. Put a screw driver between the front rim and the front frame at points A.

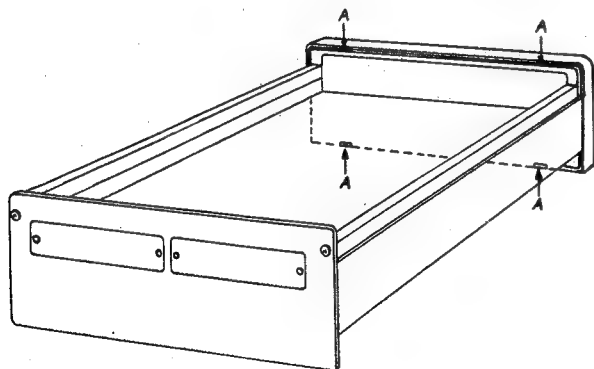


Fig. IX-2. Removing the front rim

2.3. Pry gently until front rim comes off.

2.4. Remove the text plate.

3. Handle

3.1. Remove the two plastic caps using a tiny screw driver or a pair of pliers.

3.2. Unscrew the two screws and pull out handle.

3.3. Before assembling grease, the tooth washer screwhole and teeth of the handle very *slightly* with vaseline.

4. Power supply

When replacing parts in the power supply, in particular IC150, always check the +5,0 V supply.

Proceed as follows:

4.1. Connect a voltmeter to BU107 pin +5,2 V and check that the voltage is 4.8—5.2 V

If the measured voltage does not reach 4.8—5.2 V unsolder R 1103 and select a resistor value that gives the desired voltage. The value of this resistor may be 1 k Ω to 33 k Ω . Typical value is 8 k Ω .

4.2. Check the d.c. voltages, refer to chapter VII section 3.

X. SPARE PARTS. CIRCUIT DESCRIPTION OF POWER SUPPLY AND PRESCALER UNITS, TEST CONDITIONS AND CIRCUIT DIAGRAMS

UNIT U1 ALL MODELS
FIXED RESISTORS

Ordering number Ohm Tol(%) Type Item

| | | | | | | |
|-----------|-----|-------|-------|-----|------|-------|
| 4822 | 110 | 63214 | 10M | 10 | CR25 | R1003 |
| 4822 | 110 | 63189 | 1.2M | 10 | CR25 | R1004 |
| 4822 | 110 | 63189 | 1.2M | 10 | CR25 | R1005 |
| 4822 | 110 | 63154 | 56 | 5 | CR25 | R1006 |
| 5322 | 116 | 54984 | 68 | 5 | PR37 | R1007 |
| 4822 | 110 | 63165 | 150K | 5 | CR25 | R1008 |
| 4822 | 110 | 63134 | 10K | 5 | CR25 | R1009 |
| 4822 | 110 | 63134 | 10K | 5 | CR25 | R1010 |
| 4822 | 110 | 63081 | 100 | 5 | CR25 | R1011 |
| 4822 | 110 | 60006 | 390 | 5 | CR25 | R1012 |
| 4822 | 110 | 63094 | 330 | 5 | CR25 | R1013 |
| 4822 | 110 | 63116 | 2.2K | 5 | CR25 | R1017 |
| 4822 | 110 | 63092 | 270 | 5 | CR25 | R1018 |
| 4822 | 110 | 63087 | 180 | 5 | CR25 | R1019 |
| 4822 | 110 | 63107 | 1.0K | 5 | CR25 | R1020 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1021 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1022 |
| 4822 | 110 | 63134 | 10K | 5 | CR25 | R1023 |
| 4822 | 110 | 63109 | 1.2K | 5 | CR25 | R1024 |
| 4822 | 110 | 63089 | 220 | 5 | CR25 | R1025 |
| 4822 | 110 | 63132 | 8.2K | 5 | CR25 | R1026 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1028 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1029 |
| 4822 | 110 | 63121 | 3.3K | 5 | CR25 | R1030 |
| 4822 | 110 | 63214 | 10M | 10 | CR25 | R1033 |
| 4822 | 110 | 63189 | 1.2M | 10 | CR25 | R1034 |
| 4822 | 110 | 63189 | 1.2M | 10 | CR25 | R1035 |
| 4822 | 110 | 63154 | 56 | 5 | CR25 | R1036 |
| 5322 | 116 | 54984 | 68 | 5 | PR37 | R1037 |
| 4822 | 110 | 63165 | 150K | 5 | CR25 | R1038 |
| 4822 | 110 | 63134 | 10K | 5 | CR25 | R1039 |
| 4822 | 110 | 63134 | 10K | 5 | CR25 | R1040 |
| 4822 | 110 | 63081 | 100 | 5 | CR25 | R1041 |
| 4822 | 110 | 60006 | 390 | 5 | CR25 | R1042 |
| 4822 | 110 | 63094 | 330 | 5 | CR25 | R1043 |
| 4822 | 110 | 63116 | 2.2K | 5 | CR25 | R1047 |
| 4822 | 110 | 63092 | 270 | 5 | CR25 | R1048 |
| 4822 | 110 | 63087 | 180 | 5 | CR25 | R1049 |
| 4822 | 110 | 63105 | 820 | 5 | CR25 | R1050 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1051 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1052 |
| 4822 | 110 | 63134 | 10K | 5 | CR25 | R1053 |
| 4822 | 110 | 63134 | 10K | 5 | CR25 | R1054 |
| 4822 | 110 | 63089 | 220 | 5 | CR25 | R1055 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1058 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1059 |
| 4822 | 110 | 63121 | 3.3K | 5 | CR25 | R1060 |
| 5322 | 116 | 50524 | 3.01K | 1 | MR25 | R1101 |
| 5322 | 116 | 54011 | 5.62K | 1 | MR25 | R1102 |
| SELECTED* | | | | | | |
| 4822 | 110 | 63107 | 1.0K | 5 | CR25 | R1104 |
| 4822 | 110 | 63121 | 3.3K | 5 | CR25 | R1105 |
| 4822 | 110 | 63107 | 1.0K | 5 | CR25 | R1106 |
| 4822 | 110 | 63107 | 1K | 5 | CR25 | R1107 |
| 4822 | 110 | 63109 | 1.2K | 5 | CR25 | R1108 |
| 4822 | 110 | 63116 | 2.2K | 5 | CR25 | R1109 |
| 4822 | 110 | 63169 | 220K | 5 | CR25 | R1110 |
| 4822 | 110 | 63089 | 220 | 5 | CR25 | R1111 |
| 4822 | 110 | 63063 | 22 | 5 | CR25 | R1112 |
| 4822 | 110 | 63089 | 220 | 5 | CR25 | R1113 |
| 4822 | 110 | 63032 | 1.5 | 5 | CR25 | R1114 |
| 5322 | 116 | 54963 | 0.18 | 10 | | R1115 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1116 |
| 4822 | 110 | 63089 | 220 | 5 | CR25 | R1117 |
| 4822 | 110 | 63072 | 47 | 5 | CR25 | R1118 |
| 4822 | 110 | 63169 | 220 | 5 | CR25 | R1119 |
| 4822 | 110 | 63107 | 1.0K | 5 | CR25 | R1120 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1121 |
| 4822 | 110 | 63081 | 100 | 5 | CR25 | R1122 |
| 4822 | 116 | 30114 | 4.7K | NTC | NTC | R1123 |
| 4822 | 113 | 60084 | 1.0 | 10 | | R1124 |
| 4822 | 110 | 63134 | 10K | 5 | CR25 | R1127 |
| 4822 | 110 | 63107 | 1.0 | 5 | CR25 | R1128 |
| 4822 | 110 | 63107 | 1.0 | 5 | CR25 | R1129 |
| 4822 | 110 | 63107 | 1.0 | 5 | CR25 | R1130 |
| 4822 | 110 | 63163 | 120K | 5 | CR25 | R1131 |

| | | | | | | |
|------|-----|-------|------|----|------|-------|
| 4822 | 110 | 63152 | 47K | 5 | CR25 | R1132 |
| 4822 | 110 | 63089 | 220 | 5 | CR25 | R1133 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1134 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1135 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1136 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1137 |
| 4822 | 110 | 63152 | 47K | 5 | CR25 | R1138 |
| 4822 | 110 | 63125 | 4.7K | 5 | CR25 | R1139 |
| 4822 | 110 | 63107 | 1.0 | 5 | CR25 | R1140 |
| 4822 | 110 | 63107 | 1.0 | 5 | CR25 | R1141 |
| 4822 | 110 | 63134 | 10K | 5 | CR25 | R1142 |
| 4822 | 110 | 63152 | 47K | 5 | CR25 | R1143 |
| 4822 | 110 | 63152 | 47K | 5 | CR25 | R1144 |
| 4822 | 110 | 63152 | 47K | 5 | CR25 | R1145 |
| 4822 | 110 | 63152 | 47K | 5 | CR25 | R1146 |
| 4822 | 110 | 63134 | 10K | 5 | CR25 | R1147 |
| 4822 | 110 | 63107 | 1.0 | 5 | CR25 | R1150 |
| 4822 | 110 | 63107 | 1.0 | 5 | CR25 | R1151 |
| 4822 | 110 | 60006 | 390 | 5 | CR25 | R1152 |
| 4822 | 110 | 63214 | 10M | 10 | CR25 | R1153 |
| 4822 | 110 | 63143 | 22K | 5 | CR25 | R1154 |
| 4822 | 110 | 63123 | 3.9K | 5 | CR25 | R1156 |
| 4822 | 110 | 63107 | 1.0 | 5 | CR25 | R1157 |
| 4822 | 110 | 63089 | 220 | 5 | CR25 | R1158 |
| 4822 | 110 | 63134 | 10K | 5 | CR25 | R1160 |
| 4822 | 110 | 63134 | 10K | 5 | CR25 | R1161 |
| 4822 | 110 | 63187 | 1M | 5 | CR25 | R1162 |
| 4822 | 110 | 63134 | 10K | 5 | CR25 | R1163 |
| 4822 | 110 | 63107 | 1.0 | 5 | CR25 | R1164 |
| 4822 | 110 | 63125 | 4.7K | 5 | CR25 | R1166 |
| 4822 | 110 | 63114 | 1.8K | 5 | CR25 | R1167 |
| 4822 | 110 | 63114 | 1.8K | 5 | CR25 | R1168 |
| 4822 | 110 | 63185 | 820K | 5 | CR25 | R1170 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1171 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1172 |
| 4822 | 110 | 63114 | 1.8K | 5 | CR25 | R1173 |
| 4822 | 110 | 63114 | 1.8K | 5 | CR25 | R1174 |
| 4822 | 110 | 63116 | 2.2K | 5 | CR25 | R1175 |
| 4822 | 110 | 63125 | 4.7K | 5 | CR25 | R1176 |
| 4822 | 110 | 63143 | 22K | 5 | CR25 | R1177 |
| 4822 | 110 | 63129 | 6.8K | 5 | CR25 | R1178 |
| 4822 | 110 | 63138 | 15K | 5 | CR25 | R1180 |
| 4822 | 110 | 63138 | 15K | 5 | CR25 | R1181 |
| 4822 | 110 | 63138 | 15K | 5 | CR25 | R1182 |
| 4822 | 110 | 63138 | 15K | 5 | CR25 | R1183 |
| 4822 | 110 | 63138 | 15K | 5 | CR25 | R1184 |
| 4822 | 110 | 63138 | 15K | 5 | CR25 | R1185 |
| 4822 | 110 | 63138 | 15K | 5 | CR25 | R1186 |
| 4822 | 110 | 63138 | 15K | 5 | CR25 | R1187 |
| 4822 | 110 | 63138 | 15K | 5 | CR25 | R1188 |
| 4822 | 110 | 63098 | 470 | 5 | CR25 | R1189 |
| 4822 | 110 | 63116 | 2.2K | 5 | CR25 | R1190 |
| 4822 | 110 | 63116 | 2.2K | 5 | CR25 | R1191 |
| 4822 | 110 | 63116 | 2.2K | 5 | CR25 | R1192 |
| 4822 | 110 | 63116 | 2.2K | 5 | CR25 | R1193 |
| 4822 | 110 | 63116 | 2.2K | 5 | CR25 | R1194 |
| 4822 | 110 | 63116 | 2.2K | 5 | CR25 | R1195 |
| 4822 | 110 | 63116 | 2.2K | 5 | CR25 | R1196 |
| 4822 | 110 | 63116 | 2.2K | 5 | CR25 | R1197 |

UNIT U1 ALL MODELS
VARIABLE RESISTORS

Ordering number Ohm Description Item

| | | | | | | |
|------|-----|-------|-----|-------|-------|-------|
| 5322 | 101 | 14011 | 100 | TRIMM | POTM | R1014 |
| 5322 | 101 | 64017 | 47K | SK109 | | R1015 |
| 5322 | 101 | 14011 | 100 | TRIMM | POTM | R1044 |
| 5322 | 101 | 64017 | 47K | SK119 | | R1045 |
| 5322 | 101 | 94007 | 1M | SK101 | SK102 | R1165 |

UNIT U1 ALL MODELS
FIXED CAPACITORS

Ordering number Farad Tol(%) Volts Item

| | | | | | | |
|------|-----|-------|------|--------|-----|------|
| 4822 | 121 | 40407 | 22N | 10 | 630 | C101 |
| 4822 | 122 | 31076 | 68P | 2 | 100 | C103 |
| 4822 | 122 | 31168 | 270P | 2 | 500 | C104 |
| 4822 | 122 | 31072 | 47P | 2 | 100 | C105 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C106 |
| 5322 | 121 | 40323 | 100N | 10 | 100 | C107 |
| 5322 | 124 | 14053 | 33M | -10+50 | 10 | C108 |
| 4822 | 121 | 40407 | 22N | 10 | 630 | C111 |
| 4822 | 122 | 31076 | 68P | 2 | 100 | C113 |
| 4822 | 122 | 31168 | 270P | 2 | 500 | C114 |
| 4822 | 122 | 31072 | 47P | 2 | 100 | C115 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C116 |
| 5322 | 121 | 40323 | 100N | 10 | 100 | C117 |
| 5322 | 124 | 14053 | 33M | -10+50 | 100 | C118 |
| 4822 | 122 | 31081 | 100P | 2 | 100 | C119 |
| 5322 | 124 | 14053 | 33M | -10+50 | 10 | C121 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C122 |
| 5322 | 124 | 14053 | 33M | -10+50 | 10 | C123 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C124 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C125 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C126 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C127 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C128 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C129 |
| 4822 | 121 | 40407 | 22N | 10 | 630 | C130 |
| 4822 | 122 | 31036 | 2.2P | 2 | 100 | C131 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C132 |
| 5322 | 124 | 14053 | 33M | -10+50 | 10 | C133 |
| 5322 | 124 | 14053 | 33M | -10+50 | 10 | C134 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C136 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C137 |
| 4822 | 124 | 10197 | 47M | -10+50 | 6.3 | C139 |
| 4822 | 124 | 10197 | 47M | -10+50 | 6.3 | C140 |
| 4822 | 121 | 40232 | 220N | 10 | 100 | C141 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C144 |
| 4822 | 122 | 30113 | 180P | 2 | 100 | C146 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C147 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C150 |
| 4822 | 122 | 31081 | 100P | | | C151 |
| 4822 | 124 | 20534 | 680M | -10+50 | 40 | C152 |
| 4822 | 121 | 40104 | 150N | 10 | 250 | C153 |
| 4822 | 124 | 20586 | 150M | -10+50 | 16 | C154 |
| 4822 | 124 | 20589 | 220M | -10+50 | 10 | C155 |
| 4822 | 124 | 20589 | 220M | -10+50 | 10 | C156 |
| 4822 | 124 | 20589 | 220M | -10+50 | 10 | C157 |
| 4822 | 124 | 20499 | 22M | -10+50 | 63 | C160 |
| 4822 | 124 | 20534 | 680M | -10+50 | 40 | C161 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C162 |
| 5322 | 124 | 24116 | 1M | | | C163 |
| 4822 | 122 | 31165 | 330P | 10 | 100 | C164 |
| 5322 | 124 | 14075 | 1M | -10+50 | 25 | C165 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C166 |
| 4822 | 121 | 40232 | 220N | 10 | 100 | C167 |
| 5322 | 124 | 14066 | 10M | -10+50 | 6.3 | C168 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C169 |
| 4822 | 122 | 31081 | 100P | 2 | 100 | C170 |
| 5322 | 121 | 40323 | 100N | 10 | 100 | C172 |
| 5322 | 121 | 40323 | 100N | 10 | 100 | C176 |
| 4822 | 122 | 30114 | 2.2N | 10 | 100 | C178 |
| 5322 | 122 | 34041 | 10N | -20+50 | 100 | C179 |
| 4822 | 121 | 41156 | 68N | 10 | 250 | C180 |
| 5322 | 121 | 44137 | 68N | 10 | 250 | C181 |
| 5322 | 121 | 44137 | 68N | 10 | 250 | C182 |
| 5322 | 121 | 44137 | 68N | 10 | 250 | C183 |
| 5322 | 121 | 44137 | 68N | 10 | 250 | C184 |
| 5322 | 121 | 44137 | 68N | 10 | 250 | C185 |
| 5322 | 121 | 44137 | 68N | 10 | 250 | C186 |
| 5322 | 121 | 44137 | 68N | 10 | 250 | C187 |
| 5322 | 121 | 44137 | 68N | 10 | 250 | C188 |
| 4822 | 121 | 40104 | 150N | 10 | 250 | C189 |

UNIT U1 ALL MODELS
VARIABLE CAPACITORS

Ordering number Farad Volts Item

| | | | | | |
|------|-----|-------|------|-----|------|
| 5322 | 125 | 54024 | 2-9P | 300 | C102 |
| 5322 | 125 | 54024 | 2-9P | 300 | C112 |

UNIT U1 ALL MODELS
INTEGRATED CIRCUITS

Ordering number Type Item

| | | | | |
|------|-----|-------|-------------------|-------|
| 5322 | 209 | 85408 | MC1651L | 1C101 |
| 5322 | 209 | 84643 | MC10102P | 1C102 |
| 5322 | 209 | 85409 | GXB10110 | 1C103 |
| 5322 | 209 | 84825 | MC10216P | 1C104 |
| 5322 | 209 | 84183 | SN74S74N | 1C125 |
| 5322 | 209 | 84183 | SN74S74N | 1C126 |
| 5322 | 209 | 84304 | SN75107AN | 1C127 |
| 5322 | 209 | 85406 | N74LS54A | 1C128 |
| 5322 | 209 | 84628 | N7403A | 1C129 |
| 5322 | 209 | 84528 | SN7400N | 1C130 |
| 5322 | 209 | 84722 | GZF1201P MOS | 1C131 |
| 5322 | 209 | 84722 | GZF1201P MOS | 1C132 |
| 5322 | 209 | 85001 | SN74LS157N | 1C133 |
| 5322 | 209 | 84996 | SN74LS10N | 1C134 |
| 5322 | 209 | 84183 | SN74LS74N | 1C135 |
| 5322 | 209 | 84724 | SN74S64N | 1C136 |
| 5322 | 209 | 85407 | N74S02A | 1C137 |
| 5322 | 209 | 84655 | 723PC | 1C150 |
| 5322 | 209 | 85085 | F34049PC SELECTED | 1C151 |
| 5322 | 209 | 84983 | SN74LS00N | 1C152 |
| 5322 | 209 | 85412 | CD4093BE MOS | 1C153 |
| 5322 | 209 | 84983 | SN74LS00N | 1C154 |
| 5322 | 209 | 84993 | SN74LS02N | 1C155 |
| 5322 | 209 | 84993 | SN74LS02N | 1C156 |
| 5322 | 209 | 84976 | F34001PC | 1C157 |
| 5322 | 209 | 84983 | SN74LS00N | 1C158 |
| 5322 | 209 | 84984 | SN74LS04N | 1C159 |
| 5322 | 209 | 85411 | 82S90A | 1C174 |
| 5322 | 209 | 80059 | SN7475N | 1C175 |
| 5322 | 209 | 84529 | SN7403N | 1C176 |
| 5322 | 209 | 84722 | GZF1201P MOS | 1C177 |
| 5322 | 209 | 84722 | GZF1201P MOS | 1C178 |
| 5322 | 209 | 80072 | SN7490AN | 1C179 |
| 5322 | 209 | 80142 | SN7442AN | 1C180 |
| 5322 | 209 | 84723 | DM8884AN | 1C181 |
| 5322 | 111 | 94015 | 6X1.0K | 1C190 |
| 5322 | 111 | 94015 | 6X1.0K | 1C191 |
| 5322 | 111 | 94031 | 6X47K | 1C192 |
| 5322 | 111 | 94031 | 6X47K | 1C193 |
| 5322 | 111 | 94012 | 6X6.8K | 1C194 |
| 5322 | 111 | 94012 | 6X6.8K | 1C195 |
| 5322 | 111 | 94031 | 6X47K | 1C196 |
| 5322 | 111 | 94012 | 6X6.8K | 1C197 |
| 5322 | 111 | 94026 | 6X470K | 1C198 |

UNIT U1 ALL MODELS
TRANSISTORS

Ordering number Type Item

| | | | | |
|------|-----|-------|----------------|-------|
| 5322 | 130 | 44578 | E411 SILICONIX | TS101 |
| 5322 | 130 | 44578 | E411 SILICONIX | TS102 |
| 5322 | 130 | 44435 | 2N5770 | TS103 |
| 5322 | 130 | 44435 | 2N5770 | TS104 |
| 5322 | 130 | 44197 | BC558B | TS105 |
| 5322 | 130 | 44197 | BC558B | TS106 |
| 5322 | 130 | 40407 | 2N2369 | TS142 |
| 4822 | 130 | 40855 | BC337 | TS146 |
| 5322 | 130 | 24035 | BT100A-02 | TS150 |
| 5322 | 130 | 40482 | BRY39 | TS151 |

| | | | | |
|------|-----|-------|--------|-------|
| 4822 | 130 | 40855 | BC337 | TS152 |
| 5322 | 130 | 44417 | B0X35 | TS153 |
| 5322 | 130 | 40482 | BRY39 | TS154 |
| 5322 | 130 | 44418 | BF256A | TS155 |
| 4822 | 130 | 40937 | BC548B | TS156 |
| 5322 | 130 | 44256 | BC557 | TS177 |
| 5322 | 130 | 44247 | BSS68 | TS180 |
| 5322 | 130 | 44247 | BSS68 | TS181 |
| 5322 | 130 | 44247 | BSS68 | TS182 |
| 5322 | 130 | 44247 | BSS68 | TS183 |
| 5322 | 130 | 44247 | BSS68 | TS184 |
| 5322 | 130 | 44247 | BSS68 | TS185 |
| 5322 | 130 | 44247 | BSS68 | TS186 |
| 5322 | 130 | 44247 | BSS68 | TS187 |
| 5322 | 130 | 44247 | BSS68 | TS188 |

UNIT U1 ALL MODELS DIODES

| Ordering number | Type | Item |
|-----------------|-----------|------------------|
| 5322 | 130 30392 | BZY88-C3V3 GR101 |
| 5322 | 130 30613 | BAW62 GR102 |
| 5322 | 130 30613 | BAW62 GR103 |
| 5322 | 130 30392 | BZY88-C3V3 GR104 |
| 5322 | 130 34563 | BZX79-C2V7 GR105 |
| 5322 | 130 30613 | BAW62 GR106 |
| 5322 | 130 34563 | BZX79-C2V7 GR107 |
| 5322 | 130 30613 | BAW62 GR108 |
| 5322 | 130 30392 | BZY88-C3V3 GR111 |
| 5322 | 130 30613 | BAW62 GR112 |
| 5322 | 130 30613 | BAW62 GR113 |
| 5322 | 130 30392 | BZY-C3V3 GR114 |
| 5322 | 130 34563 | BZX79-C2V7 GR115 |
| 5322 | 130 30613 | BAW62 GR116 |
| 5322 | 130 34563 | BZX79-C2V7 GR117 |
| 5322 | 130 30613 | BAW62 GR118 |
| 5322 | 130 30613 | BAW62 GR121 |
| 5322 | 130 34047 | BZX75-C1V4 GR122 |
| 5322 | 130 30613 | BAW62 GR125 |
| 5322 | 130 30613 | BAW62 GR138 |
| 5322 | 130 30613 | BAW62 GR139 |
| 5322 | 130 30613 | BAW62 GR140 |
| 5322 | 130 30613 | BAW62 GR141 |
| 5322 | 130 30613 | BAW62 GR142 |
| 5322 | 130 30613 | BAW62 GR143 |
| 5322 | 130 30613 | BAW62 GR144 |
| 5322 | 130 30613 | BAW62 GR145 |
| 5322 | 130 30774 | BZX79-C10 GR151 |
| 5322 | 130 30594 | BAV10 GR152 |
| 5322 | 130 34401 | BZX70-C56 GR153 |
| 5322 | 130 30392 | BZY88-C3V3 GR154 |
| 4822 | 130 30868 | BY210-600 GR155 |
| 4822 | 130 30868 | BY210-400 GR156 |
| 4822 | 130 30868 | BY210-400 GR157 |
| 4822 | 130 30868 | BY210-400 GR158 |
| 4822 | 130 30868 | BY210-400 GR159 |
| 5322 | 130 30759 | BZX79-C5V6 GR160 |
| 4822 | 130 30868 | BY210-400 GR161 |
| 5322 | 130 30192 | BY126 GR163 |
| 5322 | 130 30414 | BY164 GR167 |
| 5322 | 130 30613 | BAW62 GR170 |
| 5322 | 130 34049 | BZX75-C2V1 GR171 |
| 5322 | 130 30613 | BAW62 GR172 |
| 5322 | 130 30613 | BAW62 GR173 |
| 5322 | 130 30613 | BAW62 GR175 |
| 5322 | 130 34189 | BAW20 GR180 |
| 5322 | 130 34189 | BAW20 GR181 |
| 5322 | 130 34189 | BAW20 GR182 |
| 5322 | 130 34189 | BAW20 GR183 |
| 5322 | 130 34189 | BAW20 GR184 |
| 5322 | 130 34189 | BAW20 GR185 |
| 5322 | 130 34189 | BAW20 GR186 |
| 5322 | 130 34189 | BAW20 GR187 |
| 5322 | 130 34189 | BAW20 GR188 |
| 5322 | 130 34166 | BZX79-C51 GR189 |

UNIT U1 ALL MODELS INDUCTANCES

| Ordering number | Description | Item | Qty. |
|-----------------|-------------|-------------------|--------|
| 5322 | 158 10289 | INDUCTANCE 0.68MH | L101 1 |
| 5322 | 158 10289 | INDUCTANCE 0.68MH | L102 1 |
| 5322 | 158 10243 | INDUCTANCE 100MH | L103 1 |
| 5322 | 158 10284 | INDUCTANCE 47MH | L104 1 |
| 5322 | 158 10284 | INDUCTANCE 47MH | L105 1 |
| 5322 | 158 10052 | CHOKE | L150 1 |
| 4822 | 526 10097 | FXC BEAD | L151 1 |
| 5322 | 158 10052 | CHOKE | L152 1 |

UNIT U1 ALL MODELS MECHANICAL PARTS

| Ordering number | Description | Item | Qty. |
|-----------------|-------------|--------------------|------------|
| 5322 | 256 34031 | FUSEHOLDER | VL150 2 |
| 5322 | 255 44107 | IC HOLDER 16 PINS | D.I.L 2 |
| 5322 | 255 44112 | IC HOLDER 18 PINS | D.I.L 5 |
| 5322 | 255 40089 | TRANSISTOR HOLDER | TO 18-3 11 |
| 5322 | 255 40089 | TRANSISTOR HOLDER | TO 18-4 2 |
| 5322 | 265 54006 | TRANSISTOR HOLDER | TS153 1 |
| 5322 | 265 54006 | FEMALE CONNECTOR | BU 102 1 |
| 5322 | 265 54018 | MALE CONNECTOR | BU 102 1 |
| 5322 | 265 44064 | MALE CONNECTOR | BU103 1 |
| 5322 | 265 44064 | MALE CONNECTOR | BU104 1 |
| 5322 | 265 44064 | MALE CONNECTOR | BU105 1 |
| 5322 | 255 44107 | FEMALE CONNECTOR | BU106 1 |
| 5322 | 265 54006 | FEMALE CONNECTOR | BU107 1 |
| 5322 | 101 94007 | COMBINED SWITCH | SK101 1 |
| 5322 | 101 94007 | COMBINED SWITCH | SK102 1 |
| 5322 | 276 14117 | PUSH BUTTON SWITCH | SK103 1 |
| 5322 | 276 14117 | PUSH BUTTON SWITCH | SK104 1 |
| 5322 | 273 74008 | ROTARY SWITCH | SK105 1 |
| 5322 | 276 14117 | PUSH BUTTON SWITCH | SK106 1 |
| 5322 | 276 14117 | PUSH BUTTON SWITCH | SK107 1 |
| 5322 | 276 14117 | PUSH BUTTON SWITCH | SK108 1 |
| 5322 | 101 64017 | COMBINED SWITCH | SK109 1 |
| 5322 | 276 14117 | PUSH BUTTON SWITCH | SK110 1 |
| 5322 | 276 14117 | PUSH BUTTON SWITCH | SK116 1 |
| 5322 | 276 14117 | PUSH BUTTON SWITCH | SK117 1 |
| 5322 | 276 14117 | PUSH BUTTON SWITCH | SK118 1 |
| 5322 | 101 64017 | COMBINED SWITCH | SK119 1 |
| 5322 | 276 14117 | PUSH BUTTON SWITCH | SK120 1 |
| 5322 | 277 24006 | SLIDE SWITCH | SK121 1 |

UNIT U1 ALL MODELS MISCELLANEOUS

| Ordering number | Description | Item | Qty. |
|-----------------|-------------|-------------------|-----------|
| 5322 | 146 14079 | MAINS TRANSFORMER | T101 1 |
| 5322 | 142 64027 | DC-DC TRANSFORMER | T102 1 |
| 4822 | 253 20022 | FUSE 1.6A FAST | VL150 1 |
| 4822 | 252 20001 | THERMAL FUSE | VL101 1 |
| 5322 | 131 94042 | DISPLAY | B101 1 |
| 5322 | 462 34127 | GUIDE RAIL | FOR U1 14 |

FRONT PANEL ALL MODELS

| Ordering number | Description | Item | Qty. |
|-----------------|-------------|---------------------|-----------|
| 5322 | 456 14054 | TEXT PLATE | PM6622 1 |
| 5322 | 456 14055 | TEXT PLATE | PM6624 1 |
| 5322 | 456 14056 | TEXT PLATE | PM6625 1 |
| 5322 | 450 64059 | WINDOW | 1 |
| 5322 | 414 34076 | FUNCTION KNOB | SK105 1 |
| 5322 | 414 74019 | COVER FUNCTION KNOB | SK105 1 |
| 5322 | 414 34091 | DISPLAY KNOB | SK101 1 |
| 5322 | 414 74015 | COVER DISPLAY KNOB | SK101 1 |
| 5322 | 414 34091 | HOLD OFF KNOB | SK403 1 |
| 5322 | 414 74015 | COVER HOLD OFF KNOB | SK403 1 |
| 5322 | 414 34091 | TRIGGER KNOBS | 2 |
| 5322 | 414 74015 | COVER TRIGGER KNOBS | 2 |
| 5322 | 414 14011 | PUSH BUTTON KNOBS | 10 |
| 5322 | 267 10004 | INPUT SOCKETS A B | BU1 BU2 2 |

REAR PANEL ALL MODELS

| Ordering number | Description | Item |
|-----------------|---------------------|------|
| 5322 267 34059 | EXT BATTERY SOCKET | BU21 |
| 5322 267 34059 | EXT BATTERY SOCKET | BU22 |
| 5322 265 30066 | MAINS INPUT SOCKET | BU23 |
| 5322 267 10004 | INPUT D-10MHZ OUT | BU24 |
| 5322 267 10004 | EXT. RESET | BU25 |
| 5322 267 10004 | GATE OPEN | BU27 |
| 5322 277 24017 | INT EXT STD SWITCH | SK22 |
| 5322 121 44092 | CAPACITOR 47NF 250V | C1 |

CABINET ALL MODELS

| Ordering number | Description | Item |
|-----------------|------------------|------|
| 5322 498 54048 | HANDLE ARM | 2 |
| 5322 498 54054 | HANDLE PROFILE | 1 |
| 5322 520 34164 | BEARING BUSH | 2 |
| 5322 414 64053 | CAP HANDLE ARM | 2 |
| 5322 447 84467 | TOP COVER | 1 |
| 5322 447 84466 | BOTTOM COVER | 1 |
| 5322 466 85335 | FRONT ORNAMENT | 1 |
| 5322 459 24054 | REAR ORNAMENT | 1 |
| 5322 462 44181 | REAR FOOT | 4 |
| 5322 462 44179 | BOTTOM FOOT | 4 |
| 4822 462 70497 | PLUG BOTTOM FOOT | 4 |

UNIT U3 ALL MODELS

| Ordering number | Description | Item |
|-----------------|----------------|----------|
| 5322 321 24389 | CABLE COMPLETE | U3 TO U1 |
| 5322 268 24073 | TEST SOCKET | BU302 |
| 5322 268 24073 | TEST SOCKET | BU303 |
| 5322 130 34562 | LD35/II | GR301 |
| 5322 130 34562 | LD35/II | GR302 |
| 5322 130 34562 | LD35/II | GR303 |
| 5322 130 34562 | LD35/II | GR304 |
| 5322 130 34562 | LD35/II | GR305 |
| 5322 130 34562 | LD35/II | GR306 |
| 5322 130 34562 | LD35/II | GR307 |

UNIT U4 ALL MODELS

| Ordering number | Description | Item |
|-----------------|--------------------------|----------|
| 5322 321 24391 | CABLE COMPLETE | U4 TO U1 |
| 5322 277 24006 | SLIDE SWITCH | SK401 |
| 5322 277 24006 | SLIDE SWITCH | SK402 |
| 5322 101 54008 | COMBINED SK403-SK404R401 | |
| 5322 121 54118 | CAPACITOR 150NF 63V | C401 |

UNIT U2 PM6624
FIXED RESISTORS

| Ordering number | Ohm | Tol.(%) | Type | Item |
|-----------------|------|---------|------|------|
| 4822 116 51142 | 150 | 5 | PR37 | R201 |
| 5322 116 54396 | 68 | 5 | PR52 | R202 |
| 5322 116 54396 | 68 | 5 | PR52 | R203 |
| 5322 116 50417 | 162 | 5 | MR25 | R204 |
| 4822 111 30328 | 330 | 5 | CR16 | R205 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R206 |
| 4822 110 63147 | 33K | 5 | CR25 | R207 |
| 4822 110 63107 | 1K | 5 | CR25 | R208 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R209 |
| 4822 110 63152 | 47K | 5 | CR25 | R210 |
| 4822 110 63107 | 1K | 5 | CR25 | R211 |
| 4822 110 63138 | 15K | 5 | CR25 | R212 |
| 4822 111 30067 | 33 | 5 | CR16 | R213 |
| 4822 110 63134 | 10K | 5 | CR25 | R214 |
| 4822 110 63141 | 18K | 5 | CR25 | R215 |
| 4822 110 63101 | 560 | 5 | CR25 | R216 |
| 4822 111 30264 | 2.7K | 5 | CR16 | R217 |
| 4822 111 30323 | 270 | 5 | CR16 | R218 |
| 4822 111 30272 | 680 | 5 | CR16 | R219 |
| 4822 111 30245 | 47 | 5 | CR16 | R220 |
| 4822 111 30347 | 10 | 5 | CR16 | R221 |
| 4822 110 63161 | 100K | 5 | CR25 | R222 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R223 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R224 |
| 4822 110 63134 | 10K | 5 | CR25 | R225 |
| 4822 110 63098 | 470 | 5 | CR25 | R226 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R227 |
| 4822 110 63054 | 10 | 5 | CR25 | R228 |
| 4822 111 30272 | 680 | 5 | CR25 | R229 |
| 4822 110 63098 | 470 | 5 | CR25 | R230 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R231 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R238 |

UNIT U2 PM6624
FIXED CAPACITORS

| Ordering number | Farad | Tol.(%) | Volts | Item |
|-----------------|-------|---------|-------|------|
| 4822 122 31177 | 470P | 10 | 100 | C201 |
| 4822 122 31177 | 470P | 10 | 100 | C202 |
| 4822 122 31177 | 470P | 10 | 100 | C203 |
| 4822 122 31177 | 470P | 10 | 10 | C204 |
| 4822 122 30043 | 10N | -20+80 | 63 | C205 |
| 5322 122 34043 | 47P | 2 | 50 | C206 |
| 4822 122 31175 | 1N | 10 | 100 | C207 |
| 5322 124 14079 | 68M | | 6.3 | C208 |
| 4822 122 31043 | 3.9P | 2 | 63 | C209 |
| 4822 122 31173 | 220P | 10 | 100 | C211 |
| 4822 122 30094 | 220P | 10 | 100 | C212 |
| 4822 122 31177 | 470P | 10 | 100 | C213 |
| 4822 122 30043 | 10N | -20+80 | 63 | C214 |
| 5322 124 14036 | 15M | | 16 | C215 |
| 4822 122 31175 | 1N | 10 | 100 | C216 |
| 5322 122 34043 | 47P | 2 | 100 | C217 |
| 4822 122 31072 | 47P | 10 | 100 | C218 |
| 4822 122 30043 | 10N | -20+80 | 63 | C219 |
| 4822 122 31175 | 1N | 10 | 100 | C220 |
| 5322 122 34043 | 47P | 2 | 50 | C221 |
| 4822 122 31175 | 1N | 10 | 100 | C222 |
| 4822 122 31175 | 1N | 10 | 100 | C223 |
| 5322 124 14079 | 68M | | 6.3 | C224 |
| 4822 122 30043 | 10N | -20+80 | 63 | C225 |
| 4822 122 31072 | 47P | 10 | 100 | C226 |
| 4822 122 31173 | 220P | 10 | 100 | C227 |

UNIT U2 PM6624
INTEGRATED CIRCUITS

| Ordering number | Type | Item |
|-----------------|----------|-------|
| 5322 209 85414 | QM334 | IC201 |
| 5322 209 85414 | QM334 | IC202 |
| 5322 209 84721 | SP670B | IC203 |
| 5322 209 84163 | SN72741P | IC204 |
| 5322 209 84163 | SN72741P | IC205 |
| 5322 209 84165 | SN7474N | IC206 |
| 5322 209 84165 | SN7474N | IC207 |

UNIT U2 PM6624
TRANSISTORS

| Ordering number | Type | Item |
|-----------------|--------|-------|
| 4822 130 40937 | BC548B | TS201 |
| 5322 130 40348 | BC178B | TS202 |
| 5322 130 44179 | BFR90 | TS203 |
| 4822 130 40937 | BC548B | TS204 |
| 5322 130 40343 | BC108B | TS205 |

UNIT U2 PM6224
DIODES

| Ordering number | Type | Item |
|-----------------|-------------|-------|
| 5322 130 34364 | BA379 | GR201 |
| 5322 130 34364 | BA379 | GR202 |
| 5322 130 34283 | HP5082-2835 | GR203 |
| 5322 130 34283 | HP5082-2835 | GR204 |
| 5322 130 34364 | BA379 | GR205 |
| 5322 130 34364 | BA379 | GR206 |
| 5322 130 34364 | BA379 | GR207 |
| 5322 130 30613 | BAW62 | GR208 |
| 5322 130 34283 | HP5082-2835 | GR209 |
| 5322 130 34283 | HP5082-2835 | GR210 |
| 5322 130 30666 | BZX79-C7V5 | GR211 |

UNIT U2 PM6624
INDUCTANCES

| Ordering number | Description | Item |
|-----------------|------------------|------|
| 5322 158 14119 | COIL | L201 |
| 5322 158 14119 | COIL | L202 |
| 5322 158 10276 | INDUCTANCE 4.7MH | L203 |
| 5322 158 14119 | COIL | L204 |
| 4822 526 10025 | FXC BEAD | L205 |
| 4822 526 10025 | FXC BEAD | L207 |
| 4822 526 10025 | FXC BEAD | L208 |
| 4822 526 10025 | FXC BEAD | L209 |
| 4822 526 10025 | FXC BEAD | L210 |
| 5322 526 14019 | BEAD | L211 |

UNIT U2 PM6624
MECHANICAL PARTS

| Ordering number | Description | Item | Qty |
|-----------------|-----------------------|--------|-----|
| 5322 265 54006 | FEMALE CONNECTOR | BU201 | 1 |
| 5322 265 54018 | MALE CONNECTOR | BU201 | 1 |
| 5322 535 94711 | DISTANCE PIECE | FOR U2 | 2 |
| 5322 462 34054 | GUIDE RAIL | FOR U2 | 2 |
| 5322 255 44122 | IC HOLDER 14 PINS DIL | | 1 |
| 5322 255 40089 | TRANSISTOR HOLDER | TO18-3 | 2 |

UNIT U2 PM6625
FIXED RESISTORS

| Ordering number | Ohm | Tol(%) | Type | Item |
|-----------------|------|--------|------|------|
| 5322 116 54393 | 150 | 5 | PR52 | R201 |
| 5322 116 54396 | 68 | 5 | PR52 | R202 |
| 5322 116 54396 | 68 | 5 | PR52 | R203 |
| 5322 116 50417 | 162 | 5 | MR25 | R204 |
| 4822 111 30328 | 330 | 5 | CR16 | R205 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R206 |
| 4822 110 63147 | 33K | 5 | CR25 | R207 |
| 4822 110 63107 | 1K | 5 | CR25 | R208 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R209 |
| 4822 110 63152 | 47K | 5 | CR25 | R210 |
| 4822 110 63107 | 1K | 5 | CR25 | R211 |
| 4822 110 63138 | 15K | 5 | CR25 | R212 |
| 4822 111 30348 | 27 | 5 | CR16 | R213 |
| 4822 110 63134 | 10K | 5 | CR25 | R214 |
| 4822 110 63141 | 18K | 5 | CR25 | R215 |
| 4822 110 63094 | 330 | 5 | CR25 | R216 |
| 4822 111 30265 | 2.2K | 5 | CR16 | R217 |
| 4822 111 30331 | 470 | 5 | CR16 | R218 |
| 4822 111 30312 | 4.7K | 5 | CR16 | R219 |
| 4822 111 30327 | 220 | 5 | CR16 | R220 |
| 4822 111 30347 | 10 | 5 | CR16 | R221 |
| 4822 110 63161 | 100K | 5 | CR25 | R222 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R223 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R224 |
| 4822 110 63134 | 10K | 5 | CR25 | R225 |
| 4822 110 63098 | 470 | 5 | CR25 | R226 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R227 |
| 4822 110 63054 | 10 | 5 | CR25 | R228 |
| 4822 111 30272 | 680 | 5 | CR16 | R229 |
| 4822 110 63098 | 470 | 5 | CR25 | R230 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R231 |
| 4822 111 30324 | 100 | 5 | CR16 | R233 |
| 4822 111 30328 | 330 | 5 | CR16 | R234 |
| 4822 111 30328 | 330 | 5 | CR16 | R235 |
| 4822 110 63098 | 470 | 5 | CR16 | R236 |
| 4822 110 63069 | 39 | 5 | CR16 | R237 |
| 4822 110 63125 | 4.7K | 5 | CR16 | R238 |

UNIT U2 PM6625
FIXED CAPACITORS

| Ordering number | Farad | Tol(%) | Volts | Item |
|-----------------|-------|--------|-------|------|
| 5322 122 34071 | 470P | 20 | 50 | C201 |
| 5322 122 34071 | 470P | 20 | 50 | C202 |
| 5322 122 34071 | 470P | 20 | 50 | C203 |
| 5322 122 34071 | 470P | 20 | 50 | C204 |
| 4822 122 30043 | 10N | -20+80 | 63 | C205 |
| 5322 122 34043 | 47P | 10 | 50 | C206 |
| 4822 122 31175 | 1N | 10 | 100 | C207 |
| 5322 124 14079 | 68M | -10+50 | 6.3 | C208 |
| 5322 122 34043 | 47P | 10 | 50 | C209 |
| 4822 122 31173 | 220P | 10 | 100 | C210 |
| 4822 122 31173 | 220P | 10 | 100 | C211 |
| 4822 122 31173 | 220P | 10 | 100 | C212 |
| 5322 122 34071 | 470P | 10 | 50 | C213 |
| 4822 122 30043 | 10N | -20+80 | 63 | C214 |
| 5322 124 14036 | 15M | -10+50 | 16 | C215 |
| 4822 122 31175 | 1N | 10 | 100 | C216 |
| 5322 122 34071 | 470P | 20 | 50 | C217 |
| 5322 122 34042 | 12P | 10 | 50 | C218 |
| 4822 122 30043 | 10N | -20+80 | 63 | C219 |
| 4822 122 31175 | 1N | 10 | 100 | C220 |
| 4822 122 30043 | 10N | -20+80 | 63 | C221 |
| 5322 122 34043 | 47P | 10 | 50 | C222 |
| 5322 122 34071 | 470P | 20 | 50 | C223 |
| 5322 124 14079 | 68M | -10+50 | 6.3 | C224 |
| 5322 122 34071 | 470P | 10 | 50 | C225 |
| 4822 122 31072 | 47P | 2 | 100 | C226 |
| 5322 122 34071 | 470P | 20 | 50 | C227 |
| 4822 122 31072 | 47P | 2 | 100 | C228 |
| 4822 122 30043 | 10N | -20+80 | 63 | C229 |
| 5322 122 34043 | 47P | 10 | 50 | C230 |
| 4822 122 31054 | 10P | 2 | 100 | C231 |

UNIT U2 PM6625
 INTERGRATED CIRCUITS

| Ordering number | Type | Item |
|-----------------|----------|-------|
| 5322 209 85414 | OM334 | 1C201 |
| 5322 209 85414 | OM334 | 1C202 |
| 5322 209 84725 | SP8616B | 1C203 |
| 5322 209 84165 | SN72741P | 1C204 |
| 5322 209 84165 | SN72741P | 1C205 |
| 5322 209 84165 | SN7474N | 1C206 |
| 5322 209 84165 | SN7474N | 1C207 |
| 5322 209 84729 | SP8600B | 1C208 |

 UNIT U2 PM6625
 TRANSISTORS

| Ordering number | Type | Item |
|-----------------|--------|-------|
| 4822 130 40937 | BC548B | TS201 |
| 5322 130 40348 | BC178B | TS202 |
| 5322 130 44179 | BFR90 | TS203 |
| 4822 130 40937 | BC548B | TS204 |
| 5322 130 40343 | BC108B | TS205 |
| 5322 130 44435 | 2N5770 | TS206 |

 UNIT U2 PM6625
 DIODES

| Ordering number | Type | Item |
|-----------------|-------------|-------|
| 5322 130 34364 | BA379 | GR201 |
| 5322 130 34364 | BA379 | GR202 |
| 5322 130 34283 | HP5082-2835 | GR203 |
| 5322 130 34283 | HP5082-2835 | GR204 |
| 5322 130 34364 | BA379 | GR205 |
| 5322 130 34364 | BA379 | GR206 |
| 5322 130 34364 | BA379 | GR207 |
| 5322 130 30613 | BAW62 | GR208 |
| 5322 130 34283 | HP5082-2835 | GR209 |
| 5322 130 34283 | HP5082-2835 | GR210 |
| 5322 130 30666 | BZX79-C7V5 | GR211 |
| 5322 130 34364 | BA379 | GR212 |
| 5322 130 30666 | BZX79-C7V5 | GR213 |
| 5322 130 30411 | BZX79-C3V9 | GR214 |
| 5322 130 30411 | BZX79-C3V9 | GR215 |

 UNIT U2 PM6625
 INDUCTANCES

| Ordering number | Description | Item |
|-----------------|------------------|------|
| 5322 158 14119 | COIL | L201 |
| 5322 158 14119 | COIL | L202 |
| 5322 158 10276 | INDUCTANCE 4.7MH | L203 |
| 5322 158 14119 | COIL | L204 |
| 5322 158 14119 | COIL | L205 |
| 5322 158 14119 | COIL | L206 |
| 5322 158 14119 | COIL | L207 |
| 5322 158 14119 | COIL | L208 |
| 5322 157 44024 | COIL | L209 |
| 4822 526 10025 | FXC BEAD | L210 |
| 4822 526 10025 | FXC BEAD | L211 |
| 4822 526 10025 | FXC BEAD | L212 |
| 4822 526 10025 | FXC BEAD | L214 |

 UNIT U2 PM6625
 MECHANICAL PARTS

| Ordering number | Description | Item | Qty. |
|-----------------|--------------------------|--------|------|
| 5322 265 54006 | FEMALE CONNECTOR | BU201 | 1 |
| 5322 265 54018 | MALE CONNECTOR | BU201 | 1 |
| 5322 535 94711 | DISTANCE PIECE | FOR U2 | 2 |
| 5322 255 44122 | IC HOLDER 14 PINS DIL | | 1 |
| 5322 255 40089 | TRANSISTOR HOLDER T018-3 | | 2 |
| 5322 462 34054 | GUIDE RAIL | | 2 |

5. Circuit description prescaler units and power supply

5.1. Prescaler PM 6624

Unit U2 contains the 520 MHz amplifier and prescaler circuits, and also two D flip-flops IC 206 and IC 207 dividing the time base signal generated on unit U1.

The signal to be measured enters the input amplifier at socket BU 2. After AC coupling capacitor C 201, a resistive attenuator network R 201 ... R 204 is incorporated which maintains the VSWR of the input and also serves as a series impedance for the PIN diode attenuator GR 201 and GR 202. Schottky diodes GR 203 and GR 204 are clipping the signal but generate also current to the PIN diodes which provide automatically the proper attenuation of high-amplitude signals.

At low amplitude the signal passes this first PIN diode attenuator unchanged to the next PIN diode attenuator GR 205 ... GR 207. Here the amplitude is reduced further before the signal is entering the input amplifier.

After input conditioning, the measuring signal is applied to two cascade wide-band amplifiers IC 201 and IC 202. The signal level at IC 202 is detected by GR 209, GR 210 controlling the AGC amplifier IC 204 and Schmitt trigger IC 205.

When the detected level is sufficient, IC 204 starts controlling the PIN diode attenuator GR 205 ... GR 207. Transistor TS 201 ensures a linear attenuator response within the input signal range.

Via R 213, C 213 and amplifier TS 203 the signal is fed to input 10 of divide-by-eight circuit IC 203. Output 1 provides the divided signal to the 80 MHz input amplifier, BU 201.

The detected signal from GR 209, 210 is also fed to operational amplifier IC 205 performing a Schmitt trigger function. When no measuring signal is present or at a low detected level, output IC 205:6 is positive. TS 204 is then turned on, shorts the output line to earth.

When the detected signal from GR 209, 210 has reached a sufficient level, IC 205:6 goes LOW and TS 204 is turned off.

TS 202 is controlled by switch SK 401. When the switch is set to position INPUT A the level at BU 201:5 PRESCALER, goes HIGH which turns TS 202 off. Via R 230 and GR 211, also TS 205 is switched off. No supply voltage for the amplifier is present until switch SK 401 is set to position INPUT C and BU 201:5 goes LOW.

The two D flip-flops of IC 206 and one D flip-flop of IC 207 provide the division by 8 of the time base frequency TB 1.

5.2. Prescaler PM 6625

The input conditioning section of the 1 GHz amplifier up to IC 201 and the AGC and Schmitt trigger circuits are principally the same as in the 520 MHz amplifier of PM 6624. Refer to that description.

After input conditioning, the measuring signal is applied to two cascade wide-band amplifiers IC 201 and IC 202. The signal level at IC 202:7 is detected by GR 209, GR 210 controlling the AGC amplifier IC 204 and Schmitt trigger IC 205.

Via R 213, C 213 and amplifier TS 203, the signal is fed to input 4 of divide-by-four circuit IC 203. The complementary outputs 10 and 11 of this circuit provide the signal to the next 4-divider IC 208 via zeners GR 214, GR 215. These diodes are interfacing the +1 V output of IC 203 with the -3 V input requirement of IC 208. The measuring signal frequency now divided by 16, is fed via TS 206 to the output line BU 201:1 which is connected with BU 102:1 to the 80 MHz input amplifier.

TS 202 is controlled by switch SK 401. When the switch is set to position INPUT A the level at BU 201:5, PRESCALER, goes HIGH which turns TS 202 off. Via R 230 and GR 211 also TS 205 is switched off. No supply voltage for the amplifier is present until SK 401 is set to position INPUT C and BU 201:5 goes LOW.

The four D flip-flops of IC 206 and IC 207 provide the division by 16 of the time base frequency TB 1.

5.3. Power supply

The power supply operates from 115 V AC or 230 V AC 50 to 400 Hz or from the internal battery PM 9673 or from an external battery with an output voltage of 12 to 28 V. It provides five stabilised and overload-protected voltages of +120 V, +12 V, +5 V, -5 V and -50 V.

The power supply may be divided into the *power input circuit* mainly consisting of the mains transformer T 101 and rectifier GR 167, the *over-voltage protection circuit* mainly consisting of thyristors TS 150, TS 151 and zener diode GR 160, the *voltage regulation circuit* mainly consisting of voltage regulator IC 150, thyristor TS 154, the *DC-to-DC converter* mainly consisting of primary side of transformer T 102, driver TS 152 and switch TS 153.

Power input circuit

When the power supply operates from the *mains*, the 115 V AC or 230 V AC is transformed to 20 V AC by transformer T 101, rectified in the diode-bridge GR 167, filtered by C 152 and C 161 and fed to the power supply circuits via switch SK 121 and SK 102.

When the power supply operates from an *external battery* the current to the power supply circuits is fed from BU 21 at the rear panel via protecting diode GR 164 and switches SK 121 and SK 102.

When the internal battery is used the current is fed from pin 8 of BU 105 via SK 121 and SK 102 to the power supply circuits.

Over-voltage protection

The over-voltage protection circuit consists mainly of thyristors TS 150, TS 151 and zener diode GR 160.

The anode of GR 160 is connected to the +5 V output from the power supply. If this voltage increases to 5.6 V...5.8 V, the zener diode GR 160 will start to conduct and a current will flow through resistor R 1121. The voltage drop across R 1121 is fed to the gate of thyristor TS 151 via resistor R 1120. The anode is connected to the +5 V output voltage via resistor R 1118.

The thyristor will switch on and a voltage drop arises across resistor R 1122. This voltage is fed to the gate of thyristor TS 150, whose anode is connected to the d.c. input voltage. The thyristor will switch on and blow fuse VL 150, or, if the counter is operating in the internal battery mode, fuse VL 1 in the battery unit PM 9673. The capacitor across the gate and cathode of thyristor TS 151 prevents transients from the mains to blow fuse VL 150 accidentally.

DC to DC converter

The DC to DC converter is basically a blocking oscillator consisting mainly of switch transistor TS 153 and terminals 4—9 of the transformer T 102. When switch SK 102 is set to position ON, the DC voltage from the power input circuit is fed to the transistor TS 155 which works as a constant current source of approximately 1 mA (I_1).

The current I_1 will cause switch transistor TS 153 to start conducting and the linearly increasing current I_2 to flow.

This current I_2 will cause a voltage across terminals 3—8 of the transformer and the current I_3 will start to flow.

This will cause drive transistor TS 152 to saturate switch transistor TS 153. When the transistor no longer can saturate, current I_3 will stop to increase and the induced voltage at terminal 3 of transformer T 102 will disappear.

This will cause TS 153 to switch off and the collector voltage to rise to the same level as the supply voltage. At this moment the magnetic flux will discharge through the secondary windings of T 102 and diodes GR 155—159.

Output voltage regulation circuit

The output voltage regulation circuit consists mainly of voltage regulator IC 150 and thyristor TS 154.

The purpose of the thyristor TS 154 is to switch off the drive transistor TS 152 in order to regulate the output voltage. The switching moment of thyristor TS 154 is determined by a voltage at the gate of the thyristor which is the sum of a DC regulation voltage from terminal 10 of IC 150 and a sawtooth voltage caused by the emitter current of TS 153 through resistor R 1114/R 1115.

The voltage regulator IC 150 is fed at terminal 12 with the supply voltage and at terminal 7 with a negative voltage, via GR 161, from winding 3—8 of transformer T 102.

IC 150 contains a differential amplifier with inputs at terminals 4 and 5.

The input at terminal 5 is grounded via R 1104 and the

input at terminal 4 is connected to a voltage divider that consists of the reference output at terminal 6 and the negative voltage from winding 3—8 of transformer T 102 at terminal 7.

The differential amplifier is in balance when the voltage at terminal 7 is -5 V. When the supply voltage across windings 4—9 of transformer T 102 increases, the voltage at the differential amplifier at terminal 7 of IC 150 will go more negative, the DC regulation voltage at terminal 10 of IC 150 will go positive and turn on thyristor TS 154. This will connect the base of driver transistor to the ground and cause switch transistor TS 153 to switch off. The stored magnetic flux will then discharge in the secondary windings of T 102 and diodes GR 155—GR 159.

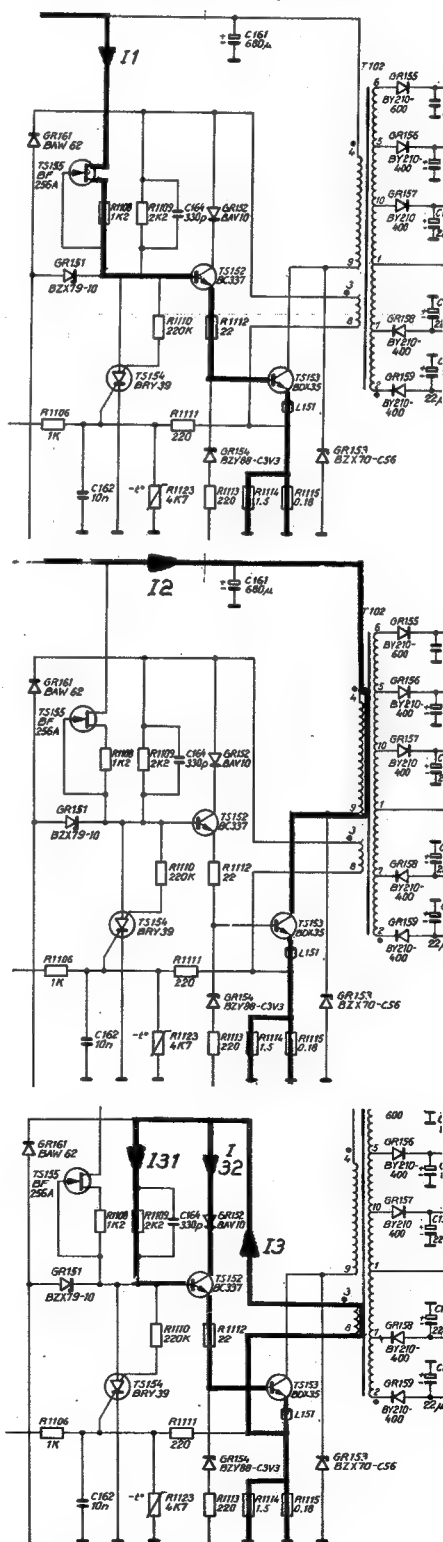


Fig. X.1. Current paths in DC to DC converter.

6. Test conditons

6.1. DC voltages.

The d.c. voltages in the circuit diagrams are typical and may vary slightly between instruments.

Unless otherwise stated the voltages are positive related to earth and measured without input signal. The test instrument can be analogue or digital with an input impedance of at least 40 k Ω /V.

NOTE. When measuring d.c. voltages in the input amplifier of the prescaler use sampling oscilloscope PM 3400 and FET probe PM 9353.

6.2. Troubleshooting the power supply section

A fault in the power supply can be isolated easier if the counter circuits are disconnected by removing

10-pins connector BU 107. However, to simulate the load, a dummy load has to be fitted as shown in the figure. The dummy load can be assembled of the following components:

| | |
|---|----------------|
| 1 female connector 10 pins | 5322 267 54102 |
| 1 carbon resistor 22 Ω , 1 W | 4822 110 23143 |
| 1 carbon resistor 220 Ω , 1 W | 4822 110 23089 |
| 1 carbon resistor, 18 Ω , 2 W | 4822 110 10061 |
| 1 carbon resistor, 56 Ω , 0.5 W | 4822 110 53074 |
| 1 carbon resistor, 5.6 k Ω , 0.5 W | 4822 110 53127 |

CAUTION: + 120 V at pin 10 of the connector!

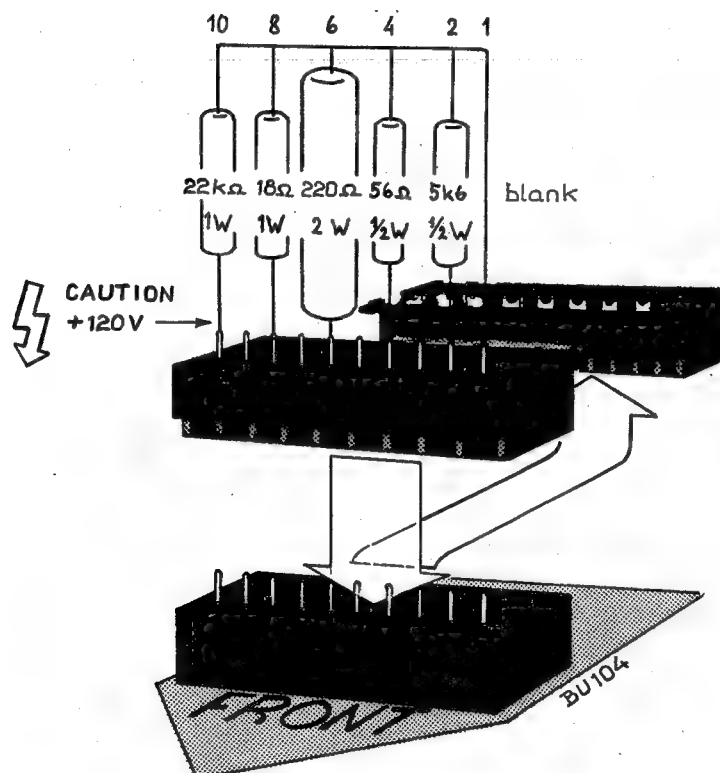


Figure X-2. Component layout U1

PHILIPS



PM 6622
9446 066 220.1

Instruction manual

Anleitung

Notice d'emploi et d'entretien



PM 6624
9446 066 240.1



PM 6625
9446 066 250.1

IMPORTANT

In correspondence concerning this instrument, please quote the type number and the serial number as given on the type plate on the rear of the instrument.

WICHTIG

Bei Schriftwechsel dieses Gerät betreffend, bitte die auf dem Typenschild an der Geräterückseite angegebene Typ- und Seriennummer zu vermelden.

IMPORTANT

Dans votre correspondance et dans vos réclamations se rapportant à cet appareil, veuillez toujours indiquer le numéro de type et le numéro de série qui sont marqués sur la plaquette signalétique.

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INHALT

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Safety regulations

Upon delivery, the instrument complies with the required safety regulations. To maintain this condition and to ensure safe operation, it is recommended to follow the instructions below.

1. Before switching on

Protection The instrument is protected according to class 1 (protective earth) of the IEC 348 or VDE 0411. The mains cable provides earth connection. Outside specially protected rooms, the mains plug must be connected only to sockets with earthed contact. It is not allowed to interrupt the earth connection inside or outside the instrument.

Mounting The instrument may be used in any desired position. Do not place the instrument on any surface which produces or radiates heat, or in direct sunlight.

Earthing The instrument must be earthed in conformity with the local safety regulations. The mains cable delivered with the instrument includes a protective conductor, which is connected to the earth contacts of the plug. Thus, when connected to an earthed mains socket, the cabinet of the instrument is consequently connected to the protective earth. The circuit earth is connected internally to the external BNC socket and the cabinet. The BNC socket must not be used to connect a protective conductor. **Warning** Connect the mains cable plug only to a socket with protective earth contacts. This protection must not be ineffective e.g. by using an extension cable without earth protection.

Mains connection The instrument must be connected only to an AC supply. On delivery the instrument is set to 230 V or 115 V indicated on the plate at the rear of the instrument. Ensure that the instrument is set to the local mains voltage before switching on.

Mains connection must be made in accordance with the local safety regulations. This implies that the instrument is connected to the mains socket with a protective earth contact as described in section Earthing.

Mains Adjustment and Fuses The instrument can be set to 115 V or 230 V. In both cases the fuse should be 1.6 A fast action, in addition to this the primary side of the mains transformer is protected by a replaceable thermal fuse. To convert the instrument proceed as follows:

- Unplug the mains cable
- Dismantle the instrument as described in section dismantling
- Resolder the wires of the mains transformer as shown on page 10.

2. Maintenance and Repair

Failure and Extensive Stress If the instrument is suspected of being unsafe take it out of operation. This is the case when the instrument shows physical damage or does not function anymore or is stressed beyond the tolerable limits e.g. during storage or transportation.

Dismantling the instrument When removing covers or other parts by means of tools, live parts or terminals could be exposed. Before opening the instrument, disconnect it from all power sources. If the open live instrument needs calibration, maintenance or a repair, it must be performed only by trained personnel being aware of the risks. After disconnection from all power sources, the capacitors in the instrument may remain charged for some seconds, observe the circuit diagrams. To dismantle the instrument proceed as follows:

- Unplug the mains cable
- Loosen the four rear screws
- Remove top and bottom covers

Repair and replacing parts Repairs must be made by trained personnel. Ensure that the construction of the instrument is not altered to the detriment of safety. Above all, leakage paths, air gaps and insulation layers must not be reduced. When replacing, use only original parts. Other spare parts are only acceptable when the safety precautions for the instrument are not impaired.

Schutzmassnahmen

Dieses Gerät entspricht bei der Werksauslieferung den geltenden Schutzvorschriften. Zur Erhaltung dieses Zustands und zur Gewährleistung der Betriebssicherheit wird die genaue Einhaltung nachstehender Hinweise empfohlen.

1. Vor der Inbetriebnahme

Schutzart Das Gerät entspricht der Schutzklasse I (Schutzleiteranschluss) gemäß IEC 348 bzw. VDE 0411. Die Geräteanschlussleitung enthält einen Schutzleiter. Ausser in Räumen mit besonderen Schutzmassnahmen darf das Gerät nur an Steckdosen mit Schutzkontakten (Schuko-Steckdosen) angeschlossen werden. Jede Unterbrechung des Schutzleiters innerhalb oder ausserhalb des Geräts ist unzulässig.

Aufstellung Das Gerät ist für jede Betriebslage vorgesehen. Wärmeeinwirkung und direkte Sonneneinstrahlung sind zu vermeiden.

Erdung Das Gerät ist nach Massgabe der örtlichen Vorschriften zu erden. Der Schutzleiter der Geräteanschlussleitung ist an die Schutzkontakte des Steckers angeschlossen. Auf diese Weise ist das Gehäuse des Geräts zwangsläufig mit Erde verbunden. Das Masse-Potential steht mit der äusseren BNC-Buchse und dem Gehäuse in Verbindung. Der Anschluss des Schutzleiters an die BNC-Buchse ist nicht zulässig. **Zu beachten!** Netzstecker nur an Schuko-Steckdosen anschliessen. Diese Schutzmassnahme darf nicht unwirksam gemacht werden (z.B. durch Verwendung einer Verlängerungsschnur ohne Schutzleiter).

Netzanschluss Das Gerät ist nur für Betrieb an Wechselspannung vorgesehen. Werksmässig ist es auf die Spannung 230 V oder 115 V eingestellt (Typenschild auf der Geräterückwand beachten!). Bei Bedarf also erst auf die örtliche Netzspannung umschalten. Der Netzanschluss muss den örtlichen Schutzvorschriften entsprechen. In jedem Fall ist aber Anschluss über eine Steckvorrichtung mit Schutzkontakten erforderlich; siehe oben unter »Erdung«.

Spannungswahl und Sicherungen Das Gerät ist auf 115 V oder 230 V einstellbar. In beiden Fällen sind flinke Sicherungen 1,6 A zu verwenden. Die Primärseite des Netztransformators ist zusätzlich durch eine auswechselbare Thermosicherung geschützt. Die Umschaltung wird wie folgt vorgenommen:

- Netzstecker ziehen
- Gehäuse abnehmen (siehe unten)
- Die Drähte am Netztransformator entsprechend der Skizze auf Seite 10 umlöten

2. Wartung und Reparatur

Fehler und Überbeanspruchung Bei Verdacht der Betriebsunsicherheit Gerät aus dem Betrieb nehmen. Dies kann der Fall sein bei sichtbaren Beschädigungen, Funktionsausfall oder übermässigen Beanspruchungen (Transport, Lagerung und dgl.).

Abnehmen des Gehäuses Beim Entfernen von Abdeckungen und Bauteilen können unter Spannung stehende Teile freigelegt werden. Vor dem Öffnen ist das Gerät daher von allen Spannungsquellen zu trennen. Abstimmung, Wartung oder Reparaturen unter Spannung dürfen nur von geschulten Fachkräften, die mit den Gefahren vertraut sind, vorgenommen werden. **Zu beachten!** Auch nach Spannungsunterbrechung sind geladene Kondensatoren noch für einige Zeit spannungsführend (Schaltplan beachten!). Gehäuse wie folgt abnehmen:

- Netzstecker ziehen
- Die vier hinteren Schrauben lösen
- Gehäuseteile oben und unten abnehmen

Reparaturen und Auswechslung von Teilen Reparaturen sind nur von Fachkräften auszuführen. Die Bauweise des Geräts darf unter keinen Umständen für den Geräteschutz nachteilig geändert werden. Insbesondere dürfen die Kriechstrecken, Sicherheitsabstände und Isolierschichten keinesfalls beeinträchtigt werden. Nur Originalersatzteile verwenden! Andere Ersatzteile sind nur zulässig, sofern sich daraus keine Nachteile für den Geräteschutz ergeben.

Prescriptions de sécurité

A la livraison, cet appareil satisfait aux normes de sécurité en vigueur. Afin de le maintenir conforme à ces normes et d'assurer son fonctionnement dans de bonnes conditions de sécurité, il est recommandé de se conformer aux instructions ci-dessous.

1. Avant la mise en marche

Protection L'appareil est protégé conformément à la classe 1 (ligne de terre protectrice) des normes IEC 348 ou VDE 0411. Son câble secteur comporte une connexion de terre. A l'extérieur des locaux spécialement protégés, ne connecter la fiche secteur qu'à des prises dotées d'un contact de terre. Toute interruption de la connexion de terre à l'intérieur ou à l'extérieur de l'appareil est proscrite.

Installation L'appareil peut être utilisé dans n'importe quelle position en fonction des besoins de l'utilisateur. Ne pas le placer sur une surface produisant ou rayonnant de la chaleur, ni à la lumière solaire directe.

Mise à la terre Mettre l'appareil à la terre conformément aux normes de sécurité locales en vigueur. Le câble secteur livré avec l'appareil comprend un conducteur protecteur relié aux contacts de terre de la fiche. Lorsqu'il est branché à une prise secteur avec terre, l'appareil a ainsi son coffret relié à la ligne de terre protectrice, laquelle est connectée intérieurement à la prise BNC externe du coffret. Ne pas utiliser cette dernière pour connecter un conducteur de protection.

Attention Ne brancher la fiche du câble secteur qu'à des prises dotées de contacts de terre. Ne pas neutraliser cette protection en utilisant par exemple un prolongateur sans conducteur de terre.

Branchement au secteur N'alimenter l'appareil qu'en courant alternatif. A sa livraison, il est couplé pour 230 V ou 115 V suivant l'indication de la plaquette placée à sa partie arrière. Bien s'assurer qu'il est couplé sur la tension secteur locale avant de le mettre en marche. La connexion de l'appareil au secteur devant être effectuée conformément aux normes locales de sécurité, elle doit comporter une ligne de terre protectrice comme décrit au chapitre Mise à la terre.

Sélection du secteur et fusibles L'appareil peut être couplé pour 115 V ou 230 V. Dans les deux cas le fusible doit être 1.6 A action rapide, en sus de ce côté principal du transformateur secteur est protégé par un fusible thermique démontable. Pour modifier le couplage de l'appareil, procéder de la manière suivante:

- Débrancher le câble Secteur
- Ouvrir l'appareil comme décrit au chapitre Ouverture
- Ressouder les fils du transformateur Secteur Conformément aux figures à la page 10

2. Maintenance et réparation

Défauts et contraintes sévères Si la sécurité de fonctionnement de l'appareil est jugée incertaine, le retirer du service. C'est notamment le cas lorsqu'il présente des dommages matériels ou ne fonctionne plus ou encore a été soumis à des contraintes hors tolérances, par exemple lors de l'entreposage ou du transport.

Ouverture de l'appareil Lors de l'enlèvement des capots ou autres parties au moyen d'outils, des organes ou des bornes sous tension peuvent se trouver exposés. Avant d'ouvrir l'appareil, le déconnecter par conséquent de toute source d'alimentation. Si l'appareil ouvert et sous tension nécessite un calibrage, une opération de maintenance ou une réparation, ne confier le travail qu'à du personnel qualifié et conscient des risques encourus. Après déconnexion des sources d'alimentation, les condensateurs de l'appareil peuvent rester chargés pendant quelques secondes, voir les schémas de connexions. Pour ouvrir l'appareil, procéder de la manière suivante:

- Débrancher le câble Secteur
- Enlever les quatre vis du fond
- Tirer les coffrets du haut et du bas

Réparation et remplacement de pièces Les réparations doivent être effectuées par du personnel qualifié. S'assurer que la constitution de l'appareil n'est pas modifiée au détriment de la sécurité. Avant tout, les lignes de fuite, les entrefers et les revêtements isolants ne doivent pas être réduits. Pour tout échange, n'utiliser que des pièces détachées d'origine. Les autres pièces de rechange ne sont acceptables que si le niveau de sécurité de l'appareil reste inchangé.

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1. Introduction

The counters in the PM 6620-series have frequency ranges from dc up to 80 MHz, 520 MHz and 1 GHz respectively for the PM 6622, PM 6624 and PM 6625. All models can measure frequency, ratio, period, time interval and have a totalizing mode. Optional accessories such as five different oscillators, a battery unit, a BCD output unit, a D/A converter and a BUS interface system extend the range of application.

2. Technical data

Properties expressed in numerical values with statement of tolerances are guaranteed. Numerical values without tolerances are intended for information purposes only and indicate the properties of an average instrument. The numerical values hold good for the nominal mains voltage.

Measurements

Frequency A

Range: dc to 80 MHz

Gate times: 10 ms, 100 ms, 1 s and 10 s

Resolution: 100 Hz, 10 Hz, 1 Hz and 0.1 Hz

Accuracy: ± 1 count \pm time base error

Frequency C

Range PM 6624: 50 MHz to 520 MHz

Range PM 6625: 50 MHz to 1000 MHz

Gate times PM 6624: 10 ms, 100 ms, 1 s and 10 s automatically multiplied with prescaling factor 8

Gate times PM 6625: 10 ms, 100 ms, 1 s and 10 s automatically multiplied with prescaling factor 16

Resolution: 100 Hz, 10 Hz, 1 Hz and 0.1 Hz

Accuracy: ± 1 count \pm time base error

Single Period B

Range: 100 ns to 10^5 s (dc to 10 MHz)

Resolution: 100 ns and 100 μ s

Accuracy: ± 1 count \pm time base error \pm trigger error*

Frequency counted: 10 MHz and 10 kHz

Period Average B

Range: 1 Hz to 10 MHz

Periods averaged (N): 10^2 , 10^4 and 10^6

Resolution: $\frac{100 \text{ ns}}{N}$

Accuracy: ± 1 count \pm time base error \pm trigger error*/N.

Frequency counted: 10 MHz

1. Einleitung

Die Universalzähler der PM 6620-Serie eignen sich für Messungen in den Frequenzbereichen von Gleichspannung bis 80 MHz (PM 6622) bzw. 520 MHz (PM 6624) und 1 GHz (PM 6625). Mit allen Modellen ist die Messung von Frequenz, Frequenzverhältnis, Periodendauer, Zeitintervall sowie Ereigniszählung möglich. Der Anwendungsbe- reich kann durch Zusatzeinheiten wie fünf verschiedene Oszillatoren, eine Batterie-Einheit, einen BCD-Ausgang, einen D/A-Wandler und ein BUS-Inter- facesystem noch wesentlich erweitert werden.

2. Technische Daten

In Zahlen mit Toleranzangabe ausgedrückte Eigenschaften sind Garantiewerte. Zahlen ohne Toleranzangabe dienen nur zur Information des Anwenders und stellen die Eigenschaften eines typischen Gerätes dar. Die Zahlenwerte gelten für Nenn-Netzspannung.

Messarten

Frequenz A

Bereich: 0 ... 80 MHz

Meßzeiten: 10 ms, 100 ms, 1 s und 10 s

Auflösung: 100 Hz, 10 Hz, 1 Hz und 0,1 Hz

Genauigkeit: ± 1 digit \pm Zeitbasisfehler

Frequenz C

Bereich PM 6624: 50 MHz ... 520 MHz

Bereich PM 6625: 50 MHz ... 1000 MHz

Meßzeiten PM 6624: 10 ms, 100 ms, 1 s und 10 s, automatisch multipliziert mit dem Vorteilerfaktor 8

Meßzeiten PM 6625: 10 ms, 100 ms, 1 s und 10 s, automatisch multipliziert mit dem Vorteilerfaktor 16.

Auflösung: 100 Hz, 10 Hz, 1 Hz und 0,1 Hz

Genauigkeit: ± 1 digit \pm Zeitbasisfehler

Einzelperiode B

Bereich: 100 ns ... 10^5 s (0 ... 10 MHz)

Auflösung: 100 ns und 100 μ s

Genauigkeit: ± 1 digit \pm Zeitbasisfehler \pm Triggerfehler*

Zählfrequenz: 10 MHz und 10 kHz

Periodendauer-Mittelwert B

Bereich: 1 Hz ... 10 MHz

Mittelwertbildung über N Perioden: 10^2 , 10^4 und 10^6

Auflösung: $\frac{100 \text{ ns}}{N}$

1. Introduction

Les compteurs PM 6622, PM 6624, PM 6625 de la série PM 6620, offrent respectivement, des gammes de fréquence du continu à 80 MHz, 520 MHz, et 1 GHz.

Ils permettent tous trois de mesurer la fréquence, le rapport, la période l'intervalle de temps, et sont équipés d'un mode de totalisation. Les accessoires en option, tels que : cinq oscillateurs différents, une unité de batterie, une unité de sortie BCD, un convertisseur D/A et un interface BUS, permettent d'étendre la gamme d'applications.

2. Caractéristiques Techniques

Les caractéristiques exprimées en valeurs numériques avec mention de tolérances sont garanties. Les valeurs numériques sans mention de tolérance sont données à titre indicatif seulement, et ce, pour la moyenne des appareils. Les valeurs numériques sont valables pour une tension secteur nominale.

Mesures

Fréquence A

Gamme : continu à 80 MHz

Temps de porte : 10 ms, 100 ms, 1 s et 10 s

Résolution : 100 Hz, 10 Hz, 1 Hz et 0.1 Hz

Précision : ± 1 impulsion \pm erreur de base de temps

Fréquence C

Gamme PM 6624 : 50 MHz à 520 MHz

Gamme PM 6625 : 50 MHz à 1000 MHz

Temps de porte PM 6624 : 10 ms, 100 ms, 1 s, et 10 s multipliés — automatiquement avec facteur de pré-éta- lonnage 8

Temps de porte PM 6625 : 10 ms, 100 ms, 1 s et 10 s multipliés — auto- matiquement avec facteur de pré-éta- lonnage 16

Résolution: 100 Hz, 10 Hz, 1 Hz, et 0.1 Hz

Précision : ± 1 impulsion \pm erreur de basé de temps

Période simple B

Gamme : 100 ns à 10^5 s (continu à 10 MHz)

Résolution : 100 ns et 100 μ s

Précision : ± 1 impulsion \pm erreur de base de temps \pm erreur de déclenche- ment*

Fréquence comptée : 10 MHz et 10 KHz

Single Time Interval A to BRange: 100 ns to 10^5 sResolution: 100 ns and 100 μ s

Time interval repetition rate: maximum 5 MHz

Accuracy: ± 1 count \pm time base error \pm trigger error**

Frequency counted: 10 MHz and 10 kHz

Time Interval Average A to B

Range: 1 ns to 1 s

Frequency counted: 10 MHz

Periods averaged (N): 10^2 , 10^4 and 10^6 Statistical resolution: 100 ns/ \sqrt{N}

Minimum time from stop to start: 250 ns

Accuracy: ± 4 ns \pm time base error \pm 100 ns trigger error**

$$\pm \frac{100 \text{ ns}}{\sqrt{N}}$$

Time Interval repetition rate: maximum 4 MHz

Count A (totalizing)Range: 1 to 10^9

Mode: accumulates pulses between a start and stop pulse or during a gate signal applied to input B

Pulse pair resolution: 12 ns

Multiple RatioRatio fA/fB: $\frac{\text{dc to } 80 \text{ MHz}}{\text{dc to } 10 \text{ MHz}}$ Ratio fC/fB PM 6624: $\frac{50 \text{ to } 520 \text{ MHz}}{\text{dc to } 10 \text{ MHz}}$ Ratio fC/fB PM 6625: $\frac{50 \text{ to } 1000 \text{ MHz}}{\text{dc to } 10 \text{ MHz}}$ Accuracy: ± 1 count \pm trigger error* of B/NMultiplier (N): 10^4 and 10^6 with correct decimal pointRatio measurements with a multiplier factor: N = 10^5 to 10^8 are obtained in Frequency measurements. In Single Period and Period Average measurements multiplier factors of 1, 10^2 , 10^4 and 10^6 can be obtained by using the external reference input.

This arrangement will not give correct decimal points.

Trigger Hold Off only PM 6622

Measuring modes: the trigger hold off (or trigger delay) works in Single Period and Single Time Interval modes.

Range: from less than 10 μ s to 100 ms in two ranges.

Monitor output: the hold off time is

Genauigkeit: ± 1 digit \pm Zeitbasisfehler \pm Triggerfehler*/N
Zählfrequenz: 10 MHz**Einzelzeitintervall A—B**Bereich: 100 ns ... 10^5 sAuflösung: 100 ns und 100 μ s

Zeitintervall-Wiederholfrequenz: max. 5 MHz

Genauigkeit: ± 1 digit \pm Zeitbasisfehler \pm Triggerfehler*

Zählfrequenz: 10 MHz und 10 kHz

Zeitintervall-Mittelwert A—B

Bereich: 1 ns ... 1 s

Zählfrequenz: 10 MHz

Mittelwertbildung über N Perioden: 10^2 , 10^4 und 10^6 Statistische Auflösung: $\frac{100 \text{ ns}}{\sqrt{N}}$

Mindestzeit zwischen Start und Stopp: 250 ns

Genauigkeit: ± 4 ns \pm Zeitbasisfehler \pm 100 ns \pm Triggerfehler**
$$\pm \frac{100 \text{ ns}}{\sqrt{N}}$$

Zeitintervall-Wiederholfrequenz: max. 4 MHz

Zählung A (Summenbildung)Bereich: 1 ... 10^9

Betrieb: Summiert Impulse zwischen einem Start- und einem Stoppsignal oder während eines Torsignals an Eingang B

Impulspaar-Auflösung: 12 ns

Frequenzverhältnis

Verhältnis fA/fB:

DC ... 80 MHz/DC ... 10 MHz

Verhältnis fC/fB (PM 6624):

50 ... 520 MHz/DC ... 10 MHz

Verhältnis fC/fB (PM 6625):

50 ... 1000 MHz/DC ... 10 MHz

Genauigkeit: ± 1 digit \pm Triggerfehler* von B/NMultiplikator (N): 10^4 und 10^6 mit korrektem DezimalpunktVerhältnismessung mit einem Multiplikator: N = 10^5 bis 10^8 sind im Frequenz-Betrieb zu erhalten, während bei Messung von Periodendauer und Periodendauer-Mittelwert die Multiplikatoren 1, 10^2 , 10^4 und 10^6 durch Verwendung des externen Referenzeingangs erhältlich sind.

Dieses Verfahren liefert jedoch keinen korrekten Dezimalpunkt.

* Der Triggerfehler beträgt höchstens $\pm 3 \times 10^{-3}$ für Sinus bei einem Signal-Rauschverhältnis von min. 40 dB.** Der Triggerfehler für beliebige Signalformen beträgt höchstens $\pm \frac{2,5 \times 10^{-3}}{\text{Signalfanke (V/ns)}} \text{ ns}$ **Période moyenne B**

Gamme : 1 Hz à 10 MHz

Périodes mises en moyenne (N) : 10^2 , 10^4 et 10^6 Résolution : $\frac{100 \text{ ns}}{N}$ Précision : ± 1 impulsion \pm erreur de base de temps \pm erreur de déclenchement*/N

Fréquence comptée : 10 MHz

Intervalle de temps simple A — BGamme : 100 ns à 10^5 sRésolution : 100 ns et 100 μ s

Taux de répétition d'intervalle de temps : Maximal de 5 MHz

Précision : ± 1 impulsion \pm erreur de base de temps \pm erreur de déclenchement**

Fréquence comptée : 10 MHz et 10 KHz

Moyenne d'intervalle de temps

A — B

Gamme : 1 ns à 1 s

Fréquence comptée : 10 MHz

Périodes mises en moyenne (N) : 10^2 , 10^4 et 10^6 Résolution statistique : 100 ns/ \sqrt{N}

Temps minimal arrêt/démarrage :

250 ns

Précision : ± 4 ns \pm erreur de base de temps \pm 100 ns erreur de déclenchement**/ \sqrt{N}

Taux de répétition d'intervalle de temps : Maximal de 4 MHz

Comptage A (totalisation)Gamme : 1 à 10^9

Mode : accumule les impulsions pendant l'intervalle de temps entre le signal d'arrêt ou le signal de porte appliqué à l'entrée B

Résolution de paire d'impulsions : 12 ns

Rapport multiple

Rapport fA/fB :

continu à 80 MHz, continu à 10 MHz

Rapport fC/fB PM 6624 :

50 à 520 MHz, continu à 10 MHz

Rapport fC/fB PM 6625 :

50 à 1000 MHz, continu à 10 MHz

Multiplicateur (N) : 10^4 et 10^6 avec le point décimal correctePrécision: ± 1 impulsion \pm erreur* de déclenchement de B/N.* Trigger error is $\leq \pm 3 \times 10^{-3}$ for sine wave signals with signal to noise ratio of ≥ 40 dB.** Trigger error for any wave shape is $\leq \pm \frac{2,5 \times 10^{-3}}{\text{Signal slope (V/ns)}} \text{ ns}$.* L'erreur de déclenchement est $\leq \pm 3 \times 10^{-3}$ pour signaux sinusoïdaux avec rapport signal/bruit ≥ 40 dB.** L'erreur de déclenchement pour chaque sinusoïde est $\leq \pm \frac{2,5 \times 10^{-3}}{\text{pente du signal (V/ns)}} \text{ ns}$.

monitored on the Gate Open output and can be digitally measured by the instrument itself.

Check

Hold off not activated: 10 MHz is internally applied to channels A and B and a functional self test of any measuring mode can be made.

Hold off activated: the set Hold Off duration will be displayed if Single Period or Time Interval mode is selected.

Input characteristics

Inputs A and B

General: inputs A and B are identical but input B is functionally limited to 10 MHz

Frequency range: dc to 80 MHz at dc coupling and 100 Hz to 80 MHz at ac coupling

Rise time: approximately 4 ns

Pulse resolution: 6 ns minimum pulse duration

Sensitivity: 20 mV_{rms} and 200 mV_{rms} for sine wave signals, 60 mV_{p-p} and 600 mV_{p-p} for pulses

Impedance: 1 M Ω //25 pF

Trigger level: preset to 0 V or variable between ± 2.5 V and ± 25 V in two ranges with higher resolution around 0 V

Trigger level monitor: set trigger voltages from -2.5 V to $+2.5$ V are available on 1 mm jacks at the front

Trigger slope: positive and negative

Coupling: dc and ac

Safe overload at 20 mV sensitivity setting: 250 V dc or 230 V_{rms} for frequencies up to 440 Hz falling to 12 V_{rms} for frequencies of 1 MHz and higher

Safe overload at 200 mV sensitivity setting: 250 V dc or 230 V_{rms}

Switching mode: separate or common

Input C

Range: 50 MHz to 520 MHz for PM 6624 and 50 MHz to 1000 MHz for PM 6625

Prescaling factor: 8 for PM 6624 and 16 for PM 6625

Dynamic input voltage range: 10 mV_{rms} to 12 V_{rms} (-27 dBm to $+35$ dBm). Above 960 MHz the sensitivity of PM 6625 might drop to -24 dBm (14 mV_{rms})

Impedance: 50 Ω

Attenuation: continuous by automatic PIN diode attenuation, maximum 62 dB

Coupling: ac

VSWR: less than 2

AM tolerance: 98 % at modulation frequencies up to 5 kHz. 30 % at modulation frequencies of 1 MHz and higher.

Safe overload: 12 V_{rms}

Triggersperre (nur PM 6622)

Betrieb: Die Triggersperre (Triggervverzögerung) HOLD OFF arbeitet bei Messungen von Einzelperioden und Einzelzeitintervall.

Bereich: Von unter 10 μ s bis 100 ms in zwei Bereichen.

Anzeige: Die Sperre wird am Ausgang GATE OPEN angezeigt und kann vom Instrument selbst digital gemessen werden.

Check

Triggersperre nicht betätigt: Ein 10-MHz-Signal wird intern an die Kanäle A und B angelegt. Dadurch ist eine funktionelle Eigenkontrolle jeder Meßfunktion möglich.

Triggersperre betätigt: Bei Messung von Periodendauer oder Zeitintervall wird die eingestellte Dauer der Triggersperre HOLD OFF angezeigt.

Eingangscharakteristika

Eingänge A und B

Allgemeines: Die Eingänge A und B sind identisch, nur ist die Funktion von Eingang B auf 10 MHz begrenzt.

Frequenzbereich: DC bis 80 MHz bei DC-Kopplung und 100 Hz bis 80 MHz bei AC-Kopplung

Anstiegszeit: ca. 4 ns

Impulsauflösung: min. Impulsdauer 6 ns

Empfindlichkeit: 20 mV_{eff} und 200 mV_{eff} für Sinussignale, 60 mV_{SS} und 600 mV_{SS} für Impulse

Impedanz: 1 M Ω //25 pF

Triggerpegel: Voreingestellt auf 0 V oder variabel zwischen ± 2.5 V und ± 25 V mit höherer Auflösung um 0 V

Triggerpegelanzeige: Eingestellte Triggerspannungen von -2.5 V bis $+2.5$ V können an Miniaturbuchsen auf der Frontseite abgenommen werden

Triggerflanke: Positiv und negativ

Kopplung: DC und AC

Überlastungsschutz bei 20 mV: 250 V DC oder 230 V_{eff} bei Frequenzen von bis zu 440 Hz, abfallend auf 12 V_{eff} bei 1 MHz oder mehr

Überlastungsschutz bei 200 mV: 250 V DC oder 230 V_{eff}

Schaltart: Gemeinsam oder getrennt

Eingang C

Bereich: 50 MHz bis 520 MHz (PM 6624) bzw. 50 MHz bis 1000 MHz (PM 6625)

Vorteilerfaktor: 8 für PM 6624 und 16 für PM 6625

Dynamischer Eingangsspannungsbereich: 10 mV_{eff} bis 12 mV_{eff} (-27 dBm bis $+35$ dBm). Über 960 MHz

Mesures de rapport avec un facteur multiplicateur : $N = 10^5$ à 10^8 sont obtenus en mesures de fréquence. Pour les mesures en Période Simple et Période moyenne les facteurs multiplicateurs de 1, 10^2 , 10^4 et 10^6 peuvent être obtenus en utilisant une entrée de référence externe.

Toutefois, cet arrangement ne fournira pas de points décimaux correctes.

Déclenchement HOLD OFF seulement PM 6622

Modes de mesures : le déclencheur Hold Off fonctionne en mode de — Période Simple et en mode d'intervalle de temps simple.

Sortie contrôle : le temps de retard est commandé sur la sortie de porte ouverte et peut être mesuré digitalement par l'instrument lui-même.

Gamme : moins que 10 μ s 0 100 ms en deux gammes

Vérification

Hold Off non-déclenché : 10 MHz est appliqué intérieurement aux voies A et B et un auto-contrôle fonctionnel peut être effectué selon n'importe quel mode de mesure

Hold Off Déclenché : la durée réglée de Hold Off sera affichée après la sélection de soit le mode de Période Simple, ou le mode d'intervalle de temps.

Caractéristiques d'Entrée

Entrées A et B

Généralités : les entrées A et B sont identiques mais, l'entrée B est limitée à une fonction de 10 MHz

Gamme de fréquence : continu à 80 MHz avec couplage en continu, et -100 Hz à 80 MHz avec couplage capacitif

Temps de montée : approximativement 4 ns

Résolution des impulsions : durée minimum de 6 ns par impulsion

Sensibilité : 20 mV_{eff} et 200 mV_{eff} pour les signaux d'ondes sinusoïdales 60 mV_{c-c} et 600 mV_{c-c} pour les impulsions

Impédance : 1 M-ohm//25 pF

Niveau de déclenchement : préréglé sur 0 V ou variable entre ± 2.5 V et ± 25 V en deux gammes avec une résolution supérieure près de 0 V

Commande du niveau de déclenchement : des tensions de déclenchement réglées de -2.5 V à $+2.5$ V sont obtenues sur les bornes avant

Pente de déclenchement : positive et négative

Couplage : continu ou capacitif

External reference input D

General: channel D is switchable between external reference frequency input and internal reference oscillator output

Frequency range: 1 kHz to 10 MHz with correct decimal point at 10 MHz

Sensitivity: 500 mV_{rms}

Impedance: approximately 10 kΩ

Coupling: ac

Safe overload: 50 V_{rms}

External reset and start

Reset: via a 0 V ± 0.4 V signal applied to the input socket

Minimum time between trailing edge and start of new measurement: 200 ns

Minimum reset pulse duration: 100 ns

Input current: at 0.4 V maximum 0.4 mA

Start of new measurement: when the input is returned to a voltage of more than +2.5 V (max. 5.5 V) or left open the counter is released to carry out a new measurement. If the Display Time Control is set to infinite position only one new measurement is made and stored and the counter can not start a new measurement until a new reset pulse has been applied.

Output characteristics

Time base oscillator output D

General: channel D is switchable between external reference frequency input and time base oscillator output

X-tal frequency: 10 MHz

Amplitude: approximately 1 V_{rms}, open circuit

Impedance: approximately 200 Ω

Coupling: dc

Safe overload: short circuit proof

Gate monitor output

General: the gate monitor output enables observation on an oscilloscope of the measured interval (and the hold off time on the PM 6622)

Output level during open main gate: less than 0.4 V

Output level during closed main gate: more than 2.5 V

Output level during hold off time: approximately 1.5 V

Output impedance: approximately 400 Ω

Delay: internal delay between the signal inputs and the trigger monitor output is approximately 65 ns

Overload protection: short circuit proof

General characteristics

Display

Read out: planar 9 digits 7 segments gas discharge display with automatic decimal point

kann die Empfindlichkeit des PM 6625 auf — 24 dBm (14 mV_{eff}) abfallen

Impedanz: 50 Ω

Dämpfung: Kontinuierlich durch automatischen PIN-Dioden-Abschwächer, max. 62 dB

Kopplung: AC

VSWR: Unter 2

AM-Toleranz: 98% bei Modulationsfrequenzen bis zu 5 kHz. 30% bei Modulationsfrequenzen von 1 MHz und mehr

Überlastungsschutz: 12 V_{eff}

Externer Referenzeingang D

Allgemeines: Der Kanal D ist umschaltbar zwischen externem Referenzfrequenz-Eingang und internem Referenz-Oszillator-Ausgang

Bereich: 1 kHz bis 10 MHz mit korrektem Dezimalpunkt bei 10 MHz

Empfindlichkeit: 500 mV_{eff}

Impedanz: ca. 10 kΩ

Kopplung: AC

Überlastschutz: 50 V_{eff}

Externes Rückstell-/Startsignal

Rückstellung: über ein 0 ± 0,4 V-Signal am Eingang

Mindestzeit zwischen Rückflanke und Beginn der neuen Messung: 200 ns

Min. Rückstellimpulsdauer: 100 ns

Eingangsstrom: max. 0,4 mA bei 0,4 V

Start einer neuen Messung: Wird der Eingang auf über + 2,5 V (max. 5,5 V) rückgestellt oder offen gelassen, so wird der Zähler für eine neue Messung freigegeben. Steht die Anzeigezeit auf unendlich, wird nur eine Messung durchgeführt und gespeichert. Der Zähler ist dann bis zum Anlegen eines neuen Rückstellsignals gesperrt.

Ausgangscharakteristika

Zeitbasis-Oszillator, Ausgang D

Allgemeines: Der Kanal D ist umschaltbar zwischen externem Referenzfrequenz-Eingang und internem Zeitbasis-Oszillator-Ausgang

Ausgangsfrequenz: 10 MHz

Amplitude: ca. 1 V_{eff} bei Leerlauf

Impedanz: 200 Ω

Kopplung: DC

Überlastschutz: kurzschlussfest

Gate-Monitor-Ausgang

Allgemeines: Der Gate-Monitor-Ausgang ermöglicht es, das gemessene Zeitintervall (und die Triggervverzögerung beim PM 6622) auf einem Oszilloskop zu überwachen.

Ausgangspegel bei offenem Haupttor: unter 0,4 V

Ausgangspegel bei geschlossenem Haupttor: über 2,5 V

Ausgangspegel während Triggervverzögerung: ca. 1,5 V

Protection de surcharge ; pour réglage de sensibilité à 20 mV : 250 V continu ou 230 V_{eff} pour les fréquences montant jusqu'à 440 Hz, tombant ensuite à 12 V_{eff} pour les fréquences de 1 MHz à monter

Protection de surcharge pour réglage de sensibilité à 200 mV : 250 V continu ou 230 V_{eff}

Modes d'entrée : séparée ou commune

Entrée C

Gamme : 50 MHz à 520 MHz pour PM 6624 et 50 MHz à 1000 MHz pour PM 6625

Facteur de pré-étalonnage : 8 pour PM 6624, et 16 pour PM 6625

Gamme de tension dynamique d'entrée: 10 mV_{eff} à 12 mV_{eff} (— 27 dBm à + 35 dBm). Audessus de 960 MHz la sensibilité pourrait baisser jusqu'à — 24 dBm, 14 mV_{eff}

Impédance : 50 ohm

Atténuation : par atténuateur à diodes PIN automatique, 62 dB maximum

Couplage : capacitif

Taux d'ondes stationnaires (VSWR) : < 2

Tolérance AM : 98 % en modulation de fréquence allant jusqu'à 5 kHz, 30 % en modulation de fréquence de 1 MHz à monter

Protection de surcharge : 12 V_{eff}

Entrée de référence externe D

Généralité : la voie D est commutable entre l'entrée externe à fréquence de référence, et la sortie de l'oscillateur à référence interne

Gamme de fréquence : 1 kHz à 10 MHz avec point décimal correcte à 10 MHz

Sensibilité : 500 mV_{eff}

Impédance : approximativement 10 k-ohm

Couplage : capacitif

Protection de surcharge : 50 V_{eff}

Remise à zéro/Démarrage externe

Remise à zéro : via un signal de 0 V ± 0.4 V appliqué à l'entrée EXT. RESET

Temps minimum entre la suite d'un affichage et le démarrage d'une nouvelle mesure : 200 ns

Durée minimum de l'impulsion de remise : 100 ns

Courant d'entrée : 0,4 mA max. à 0,4 V

Démarrage d'une nouvelle mesure : quand l'entrée est remise à une tension supérieure à + 2.5 V (5.5 V Max.) ou que l'entrée est maintenue ouverte, une nouvelle mesure est alors démarrée. Si la commande DISPLAY TIME est réglée pour un temps d'affichage infini, alors une seule nouvelle mesure est démarrée et stockée. Le compteur ne peut pas alors faire démarrer une nou-

Unit annunciators: kHz, MHz, ms and ns

Display time: 50 ms to 4 s and infinite

Reset: pushing "Reset" resets the counter, releasing it starts new measurement

Gate lamp: indicates that main gate is open and counting takes place. In the Stand By position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.

Memory: display storage holds reading between samples and can be switched off by front panel "Memory" push-button

Trigger Indicator: tri state LED with stretched operation (channels A and B). Light on indicates too high trigger level, light off too low trigger level and blinking indicates that triggering occurs.

Power requirements

Line voltage: 115/230 V $\pm 15\%$

Line frequency: 45 to 440 Hz

Consumption: depending on type no, crystal oscillator and options. Approximately 15 VA.

Mains interference: below Class II CENELEC/CISPR

Internal battery: PM 9673, power consumption approximately 8 W

External battery: 11.8 to 28 V, power consumption approximately 8 W. 4 mm banana connectors.

Oven oscillator: power consumption 100 mA in Stand By position

Environmental conditions

Storage temperature: -40°C to $+70^{\circ}\text{C}$

Operating temperature: 0°C to $+50^{\circ}\text{C}$

Storage altitude: 15000 m (15.2 kN/m²)

Operating altitude: 5000 m (53.3 kN/m²)

Humidity: 10 to 90 % RH (26°C dew point)

Vibration test: IEC 68 Fc

Bump test: IEC 68 Eb

Handling test: IEC 68 Ec

Transport test: NLN-L88

Dimensions and Weight

Width: 210 mm (8.25")

Height: 89 mm (3.5")

Depth: 325 mm (12.8")

Weight: 2.8 kg (6.2 lb)

3. Options

Standard oscillator PM 9677

Frequency: 10 MHz

Trimming range: more than ± 200 Hz

Output voltage into 1 k Ω : more than 300 mV

Supply voltage: 12 V

Consumption: less than 100 mW at 25°C

Ausgangsimpedanz: ca. 400 Ω

Verzögerung: Die interne Verzögerung zwischen den Signaleingängen und dem Triggermonitor-Ausgang beträgt ca. 65 ns.

Überlastungsschutz: kurzschlußfest.

Allgemeine Daten

Anzeige

Ablesung: Planar, 9 Stellen; 7-Segment-Gasentladungsröhren mit automatischem Dezimalpunkt

Einheitenangabe: kHz, MHz, ms und ns

Anzeigedauer: 50 ms bis 4 s und unbegrenzt

Rückstellung: Drücken des Knopfes RESET stellt den Zähler auf Null zurück. Durch Loslassen wird eine neue Zählung gestartet.

GATE Lampe: Zeigt an, daß das Haupttor offen ist und eine Zählung stattfindet. In der Stellung STAND BY zeigt die Lampe GATE an, daß Netz oder Batterie anliegen, um den Quarz-Oszillator zu stabilisieren.

Speicher: Die Anzeigespeicherung hält die Anzeige zwischen Meßvorgängen. Sie läßt sich durch die frontseitige Drucktaste MEMORY abschalten.

Triggeranzeige: Tristabile LED-Kontrollampen (Kanal A und B). Lampe EIN zeigt zu hohen und Lampe AUS zu niedrigen Triggerpegel an. Bei Triggerung Blinklicht.

Speisung

Netzspannung: 115/230 V $\pm 15\%$

Netzfrequenz: 45 bis 440 Hz

Leistungsaufnahme: Abhängig von Typennr., Quarzoszillator und Zubehör; ca. 15 VA

Netzstörungen: unter Class II CENELEC/CISPR

Interne Batterie: PM 9673, Leistungsverbrauch ca. 8 W

Externe Batterie: 11,8 bis 28 V, Leistungsverbrauch ca. 8 W; 4-mm-Banannenstecker

Geheizter Oszillator: Verbrauch 100 mA in Bereitschaftsbetrieb (Stand by)

Umgebungsbedingungen

Lagertemperatur: -40°C bis $+70^{\circ}\text{C}$

Betriebstemperatur: 0°C bis $+50^{\circ}\text{C}$

Lagerhöhe: 15000 m (15,2 kN/m²)

Betriebshöhe: 5000 m (53,3 kN/m²)

Feuchtigkeit: 10 bis 90 % rel. Luftfeuchtigkeit (Taupunkt 26°C)

Vibrationsfestigkeit: nach IEC 68 Fc

Stoßfestigkeit: nach IEC 68 Eb

Bedienungstest: nach IEC 68 Ec

Transporttest: nach NLN-88

velle mesure jusqu'à ce qu'une nouvelle impulsion de remise soit appliquée

Caractéristiques de sortie

Sortie oscillateur base de temps D

Généralités: la voie D est commutable entre l'entrée externe de la fréquence de référence et la sortie de l'oscillateur base de temps

Fréquence cristal: 10 MHz

Amplitude: approx. 1 V_{eff} à circuit ouvert

Impédance: approx. 200 ohm

Couplage: alternatif

Protection de surcharge: contre les court-circuits

Sortie témoin de porte

Généralités: la sortie témoin de porte permet l'observation sur un oscilloscope d'un intervalle mesuré, (ainsi que le temps de retard sur le PM 6622)

Niveau de sortie en porte principale ouverte: < 0.4 V

Niveau de sortie en porte principale fermée: > 2.5 V

Niveau de sortie en temps de retard: approx. 1.5 V

Sortie impédance: approx. 400 ohm

Retard: le retard interne entre les signaux d'entrée et la sortie témoin du déclenchement est approx. de 65 ns

Protection de surcharge: contre les court-circuits

Caractéristiques Générales

Affichage

Sortie lecture: 9 chiffres, affichage à 7 segments, (gaz), et avec point décimal automatique

Indicateurs d'unités: kHz, MHz, ms et ns

Temps d'affichage: 50 ms à 4 s et infini

Remise à zéro: la commande "RESET" enfoncée, remet le compteur à zéro, et en position relâchée une nouvelle mesure démarre

Lampe de porte: Indique que la porte principale est ouverte et que le comptage a lieu; en position d'attente, la lampe de porte indique que la tension secteur ou la batterie est appliquée en vue de la stabilisation de l'oscillateur cristal

Mémoire: l'affichage retient la lecture entre les informations et peut être grâce au bouton-poussoir "Memory" sur le panneau avant

Indicateur de déclenchement: LED tri-à opération prolongée (voies A et B). Lorsque la lampe est allumée en permanence, le niveau de déclenchement est trop élevé, lorsque la lampe est éteinte en permanence, le niveau de

Ageing: less than 5×10^{-7} per month
Temperature deviation 0°C to 50°C:
 less than 1×10^{-5} with reference to +25°C

Change in measuring and supply mode:
 less than 3×10^{-7}

Line voltage $\pm 10\%$ deviation: less than 1×10^{-8}

Environmental data: same as the counter

Dimension: 93×50×20 mm

Weight: 50 g

TCXO PM 9678

Frequency: 10 MHz

Trimming range: more than ± 20 Hz will cover at least 10 years of operation

Output voltage into 1 k Ω : more than 100 mV

Supply voltage: 12 V

Consumption: less than 200 mW at 25°C

Ageing: less than 1×10^{-7} /month, the ageing will decrease substantially after the first 6 months

Temperature deviation 0°C to 50°C:
 less than 1×10^{-6} with reference to +25°C

Change in measuring and supply mode:
 less than 5×10^{-8}

Line voltage $\pm 10\%$ deviation: less than 1×10^{-9}

Environmental data: same as the counter

Dimensions: 93×50×15 mm

Weight: 25 g

Oven oscillator PM 9679B

Frequency: 10 MHz

Trimming range: + 20 Hz and — 30 Hz fine trimming range. A coarse trimmer is available to adjust for an ageing of more than 10 years

Output voltage into 1 k Ω : more than 150 mV

Supply voltage: + 11.5 to 28 V from unregulated power supply

Consumption at continuous operation and stand by: less than 125 mA

Warm up consumption: less than 400 mA

Ageing: less than 1×10^{-7} /month after 72 hours of continuous operation

Temperature deviation (0°C to 50°C):
 less than 1×10^{-7} with reference to 25°C

Line voltage ($\pm 10\%$ deviation): less than 1×10^{-9}

Change in measuring and supply mode:
 less than 1×10^{-8}

Warm up time: less than 15 minutes to reach 1×10^{-7}

Environmental data: same as the counter

Dimension: 100 × 52 × 35 mm

Weight: 100 g

Abmessungen und Gewicht

Breite: 210 mm

Höhe: 89 mm

Tiefe: 325 mm

Gewicht: 2,8 kg

3. Zubehör

Standard Oszillator PM 9677

Frequenz: 10 MHz

Abstimmbereich: mehr als ± 200 Hz
Ausgangsspannung an 1 k Ω : mehr als 300 mV

Speisespannung: 12 V

Verbrauch: unter 100 mW bei 25°C

Alterung: unter 5×10^{-7} pro Monat

Temperaturabweichung 0°C bis 50°C:
 unter 1×10^{-5} bezogen auf +25°C

Wechsel von Betriebsart und Speisung (Netz/Batterie): unter 3×10^{-7}

Netzspannung $\pm 10\%$: unter 1×10^{-8}

Umgebungsbedingungen: wie der Zähler

Abmessungen: 93×50×20 mm

Gewicht: 50 g

TCXO PM 9678

Frequenz: 10 MHz

Abstimmbereich: über ± 20 Hz; ausreichend für min. 10 Betriebsjahre

Ausgangsspannung an 1 k Ω : über 100 mV

Speisespannung: 12 V

Verbrauch: unter 200 mW bei 25°C

Alterung: unter 1×10^{-7} pro Monat; nach den ersten sechs Monaten nimmt die Alterung bedeutend ab.

Temperaturabweichung 0°C bis 50°C:
 unter 1×10^{-6} bezogen auf +25°C

Wechsel von Betriebsart und Speisung (Netz/Batterie): unter 1×10^{-8}

Netzspannung $\pm 10\%$: unter 1×10^{-9}

Umgebungsbedingungen: wie der Zähler

Abmessungen: 93×50×15 mm

Gewicht: 25 g

Geheizter Oszillator PM 9679B

Frequenz: 10 MHz

Abstimmbereich: + 20 Hz und — 30 Hz zur Feinabstimmung. Zum Abgleich einer Alterung von mehr als 10 Jahren ist ein Grobtrimmer vorgesehen

Ausgangsspannung an 1 k Ω : über 150 mV

Speisespannung: + 11,5 bis 28 V aus nichtstabilisierter Speisung

Verbrauch bei Dauerbetrieb und Stand by: unter 125 mA

Verbrauch bei Anheizung: unter 400 mA

Alterung: unter 1×10^{-7} pro 24 h nach 72 Stunden Dauerbetrieb

Temperaturabweichung 0°C bis 50°C:
 unter 1×10^{-7} bezogen auf +25°C

Netzspannung $\pm 10\%$: unter 1×10^{-9}

Wechsel von Betriebsart und Speisung (Netz/Batterie): unter 1×10^{-8}

déclenchement est trop bas, et quand la lampe clignote, le déclenchement est effectué

Consommation

Tension secteur: 115/230 V $\pm 15\%$

Fréquence secteur: 45 à 440 Hz

Consommation: selon le numéro du modèle, l'oscillateur cristal et les options (approx. 15 VA)

Interférence secteur: Audessous de class II SENELEC CISPR

Batterie interne: PM 9673, Consommation approx. 8 W

Batterie externe: 11.8 à 28 V avec une consommation d'environ 8 W, Connecteurs de 4 mm, type banane

Oscillateur à enceinte thermostatée: consommation de 100 mA en position d'attente

Caractéristiques d'environnement

Température de stockage: — 40° C à + 70° C

Température de fonctionnement: 0° C à + 50° C

Altitude de stockage: 15000 m

(15.2 kN/m²)

Altitude de fonctionnement: 5000 m

(53.3 kN/m²)

Humidité: 10 à 90 % RH (26° C point requis)

Epreuve à la vibration: conforme à la norme IEC 68 Fc

Epreuve au choc: conforme à la norme IEC 68 Eb

Epreuve manipulation: conforme à la norme IEC 68 Ec

Epreuve transportation: conforme à la norme NLN-L88

Dimensions et poids

Largeur: 210 mm (8.25")

Hauter: 89 mm (3.5")

Profondeur: 325 mm (12.8")

Poids: 2.8 Kg (6.2 lb)

3. Options

Oscillateur standard PM 9677

Fréquence: 10 MHz

Gamme d'ajustement: supérieure à ± 200 Hz

Tension de sortie sous 1 k-ohm: supérieure à 300 mV

Tension d'alimentation: 12 V

Consommation: inférieure à 100 mW pour 25 C

Usure: inférieure à 5×10^{-7} pour un mois

Déviati on de température de 0° C à 50° C: inférieure à 1×10^{-5} par rapport à + 25° C

Variation de la mesure et du mode d'alimentation: inférieure à 3×10^{-7}

Déviati on $\pm 10\%$ de la tension secteur: inférieure à 1×10^{-8}

Oven oscillator PM 9690**Frequency:** 10 MHz**Trimming range:** +3 Hz and —7 Hz fine trimming range. A coarse trimmer is available to adjust for an ageing of more than 10 years**Output voltage into 1 k Ω :** more than 150 mV**Supply voltage:** +11.5 to 28 V from unregulated power supply**Consumption at continuous operation and stand by:** less than 125 mA**Warm up consumption:** less than 400 mA**Ageing:** less than $1.5 \times 10^{-9}/24$ h after 72 hours of continuous operation**Temperature deviation 0°C to 50°C:** less than 3×10^{-8} with reference to + 25°C**Line voltage $\pm 10\%$ deviation:** less than 5×10^{-10} **Change in measuring and supply mode:** less than 3×10^{-9} **Warm up time:** less than 15 minutes to reach 1×10^{-7} **Environmental data:** same as the counter**Dimensions:** 100×52×35 mm**Weight:** 100 g**Oven oscillator PM 9691****Frequency:** 10 MHz**Trimming range:** + 3 Hz and — 7 Hz fine trimming range. A coarse trimmer is available to adjust for an ageing of more than 10 years**Output voltage into 1 k Ω :** more than 150 mV**Supply voltage:** + 11.5 to 28 V from unregulated power supply**Consumption at continuous operation and stand by:** less than 125 mA**Warm up consumption:** less than 400 mA**Ageing:** less than $5 \times 10^{-10}/24$ h after 72 hours of continuous operation**Temperature deviation (0°C to 50°C):** less than 5×10^{-9} with reference to + 25°C**Line voltage ($\pm 10\%$ deviation):** less than 5×10^{-10} **Change in measuring and supply mode:** less than 3×10^{-9} **Warm up time:** less than 15 minutes to reach 1×10^{-7} **Environmental data:** same as the counter**Dimension:** 100 × 52 × 35 mm**Weight:** 100 g**Rack mount adapter****PM 9669/01:** 19" rack for one counter**PM 9669/02:** 19" rack for two counters**Battery unit****PM 9673:** rechargeable battery for inside mounting**Anheizdauer:** unter 15 Minuten, um 1×10^{-7} zu erreichen**Umgebungsbedingungen:** wie der Zähler**Abmessungen:** 100 × 52 × 35 mm**Gewicht:** 100 g**Geheizter Oszillator PM 9690****Frequenz:** 10 MHz**Abstimmbereich:** +3 Hz und —7 Hz zur Feinabstimmung. Zum Abgleich einer Alterung von mehr als 10 Jahren ist ein Grobtrimmer vorgesehen
Ausgangsspannung an 1 k Ω : über 150 mV**Speisespannung:** +11,5 bis 28 V aus nichtstabilisierter Speisung**Verbrauch bei Dauerbetrieb und Stand by:** unter 125 mA**Verbrauch bei Anheizung:** unter 400 mA**Alterung:** unter $1,5 \times 10^{-9}$ pro 24 h nach 72 Stunden Dauerbetrieb**Temperaturabweichung 0°C bis 50°C:** unter 3×10^{-8} bezogen auf + 25°C**Netzspannung $\pm 10\%$:** unter 5×10^{-10} **Wechsel von Betriebsart und Speisung (Netz/Batterie):** unter 3×10^{-9} **Anheizdauer:** unter 15 Minuten, um 1×10^{-7} zu erreichen**Umgebungsbedingungen:** wie der Zähler**Abmessungen:** 100×52×35 mm**Gewicht:** 100 g**Geheizter Oszillator PM 9691****Frequenz:** 10 MHz**Abstimmbereich:** + 3 Hz und — 7 Hz zur Feinabstimmung. Zum Abgleich einer Alterung von mehr als 10 Jahren ist ein Grobtrimmer vorgesehen
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Identiques à celles du compteur

Dimension : 93 × 50 × 15 mm**Poids :** 25 g**Oscillateur à enceinte thermostatée PM 9679B****Fréquence :** 10 MHz**Gamme d'ajustement :** + 20 Hz et — 30 Hz avec réglage fin. Un dispositif d'ajustement ordinaire est disponible pour suppléer à un usage de plus de dix ans**Tension de sortie sous 1 k-ohm :** supérieure à 150 mV**Tension d'alimentation :** + 11.5 à 28 V non-régulée**Consommation en opération continue et en position d'attente :** inférieure à 100 mA**Consommation au chauffage :** inférieure à 400 mA**Usure :** inférieure à $1 \times 10^{-7}/24$ h après 72 heures d'opération continue**Déviati on de température de 0° C à 50° C :** inférieure à 1×10^{-7} par rapport à + 25° C**Déviati on $\pm 10\%$ tension secteur :** inférieure à 1×10^{-9} **Variation de la mesure et du mode d'alimentation :** inférieure à 1×10^{-8} **Temps de chauffage :** inférieure à 15 minutes pour atteindre 1×10^{-7} **Caractéristiques d'environnement :**

Identiques à celles du compteur

Dimensions : 100 × 52 × 35 mm**Poids :** 100 g**Oscillateur à enceinte thermostatée PM 9690****Fréquence :** 10 MHz**Gamme d'ajustement :** + 3 Hz et — 7 Hz avec réglage fin. Un dispositif d'ajuste-

Carrying case

PM 9672: carrying case for the counter and measuring leads during transportation

Output interface units

PM 9674: BCD output unit
PM 9675: digital to analog converter
PM 9676: bus interface unit

Accessories included with the instrument

Operation and service manual
 Line cord
 Front panel protective cover

Tragtasche

PM 9672: Tragtasche für Gerät und Meßkabel

Ausgangs-/Interface-Einheiten

PM 9674: BCD-Ausgangseinheit
PM 9675: Digital-/Analogwandler
PM 9676: BUS-Interface

Mitgeliefertes Zubehör

Handbuch
 Netzkabel
 Frontplatten-Schutzdeckel

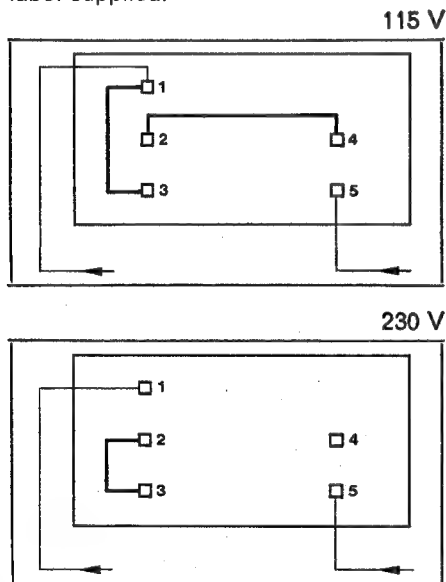
4. Installation

Mains voltage conversion: the counter can be converted into two mains voltage ranges, 100 to 130 V and 200 to 260 V.

The frequency range is 45 to 440 Hz.

At delivery the instrument is set to the 200 to 260 V range.

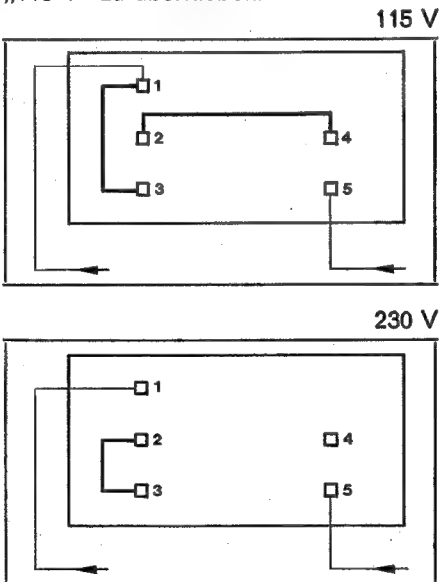
When changing to the 100 to 130 V range the connections of the mains transformer should be changed as shown in the figure below, and the "230 V" label covered with the "115 V" label supplied.



4. Installation

Netzspannungsänderung: Das Gerät läßt sich auf zwei Netzspannungsbereiche, 100—130 V und 200—260 V umschalten. Der Frequenzbereich ist 45 bis 440 Hz. Bei Lieferung ist der Zähler auf 200—260 V eingestellt.

Die Umschaltung auf 100—130 V geschieht durch Änderung der Anschlüsse des Netztransformators entspr. untenstehender Abbildung. Das Schild „230 V“ ist dann mit dem Schild „115 V“ zu überkleben.



Earthing: the counter can be earthed via the protective earth terminal at the rear panel or via a three core mains cable plugged into an outlet with protective earth contact.

Use only one of these alternatives to avoid hum.

Fuses: a thermal fuse on the mains transformer and a 1.6 A fast action fuse are protecting the power supply.

Options: refer to installation instruction for each type number.

Erdung: Das Gerät ist entweder über die Schutzterdungsklemme auf der Rückseite oder über den Schutzleiter des Netzkabels (nur an Schutzkontakt-Steckdose anschließen!) zu erden.

Nur eine dieser Erdungsmöglichkeiten verwenden, um Brummen zu vermeiden.

Sicherungen: Der Netzteil ist durch eine thermische Sicherung am Netztrafo und eine flinke 1,6-A-Sicherung geschützt.

Zubehör: Anleitungen zur Installation enthält das jeweilige Handbuch.

ment ordinaire est disponible pour suppléer à un usage de plus de dix ans

Tension de sortie sous 1 k-ohm : supérieure à 150 mV

Tension d'alimentation : + 11.5 à 28 V non-régulée

Consommation en opération continue et en position d'attente : inférieure à 125 mA

Consommation au chauffage : inférieure à 400 mA

Usure : inférieure à $1.5 \times 10^{-9}/24$ h après 72 heures d'opération continue

Déviations de température de 0° C à 50° C : inférieure à 3×10^{-8} par rapport à + 25° C

Déviations $\pm 10\%$ tension secteur : inférieure à 5×10^{-10}

Variation de la mesure et du mode d'alimentation : inférieure à 3×10^{-9}

Temps de chauffage : inférieure à 15 minutes pour atteindre 1×10^{-7}

Caractéristiques d'environnement : Identiques à celles du compteur

Dimensions : 100 \times 52 \times 35 mm

Poids : 100 g

Oscillateur à enceinte thermostatée PM 9691

Fréquence : 10 MHz

Gamme d'ajustement : + 3 Hz et — 7 Hz avec réglage fin. Un dispositif d'ajustement ordinaire est disponible pour suppléer à un usage de plus de dix ans

Tension de sortie sous 1 k-ohm : supérieure à 150 mV

Tension d'alimentation : + 11.5 à 28 V non-régulée

Consommation en opération continue et en position d'attente : inférieure à 125 mA

Consommation au chauffage : inférieure à 400 mA

Usure : inférieure à $1.5 \times 10^{-10}/24$ h après 72 heures d'opération continue

Déviations de température de 0° C à 50° C : inférieure à 3×10^{-9} par rapport à + 25° C

Déviations $\pm 10\%$ tension secteur : inférieure à 5×10^{-10}

Variation de la mesure et du mode d'alimentation : inférieure à 3×10^{-9}

Temps de chauffage : inférieure à 15 minutes pour atteindre 1×10^{-7}

Caractéristiques d'environnement : Identiques à celles du compteur

Dimensions : 100 \times 52 \times 35 mm

Poids : 100 g

Adapteur pour montage Rack

PM 9669/01 : rack 19" pour un compteur

PM 9669/02 : rack 19" pour deux compteurs

Batterie

PM 9673 : batterie rechargeable pour montage interne

Valise

PM 9672 : une malette pour le compteur et pour les cordons de mesure

Unités interface de sortie

PM 9674 : unité de sortie BCD

PM 9675 : convertisseur digital/analogique

PM 9676 : unité interface bus

Accessoires livrés avec l'appareil

Notice d'emploi et d'entretien

Cordon secteur

Couverture de protection pour panneau avant

4. Installation

Adaption secteur : le compteur peut être adapté à deux gammes de tension secteur, de 100 à 130 V et de 200 à 260 V.

La gamme de fréquence est de 45 à 440 Hz.

A la livraison, l'appareil est adapté pour la gamme de 200 à 260 V.

Pour adapter à une gamme de 100 à 130 V, modifier les connexions du transformateur secteur conformément à la figure ci-dessous et coller une étiquette de "115 V" à la place de celle de "230 V".

Mise à la terre : La mise à la terre peut être effectuée selon deux façons ;

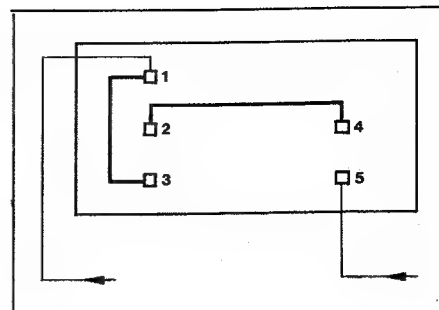
1. par une prise de protection terre sur le panneau arrière.
2. par le câble secteur à trois conducteurs enfilés dans une prise comportant une terre.

Remarque : il est recommandé de ne se servir que d'une de ces alternatives afin d'éviter les bruits de fond.

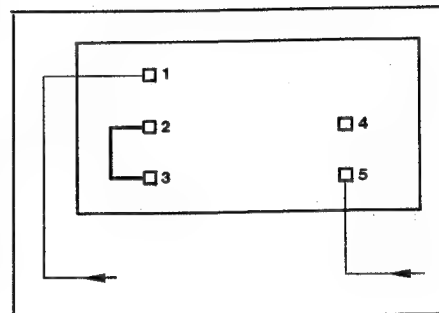
Fusible : un fusible thermique au transformateur secteur et un fusible de 1.6 A à action rapide protègent l'alimentation secteur.

Options : se référer aux instructions de l'installation pour chaque modèle.

115 V



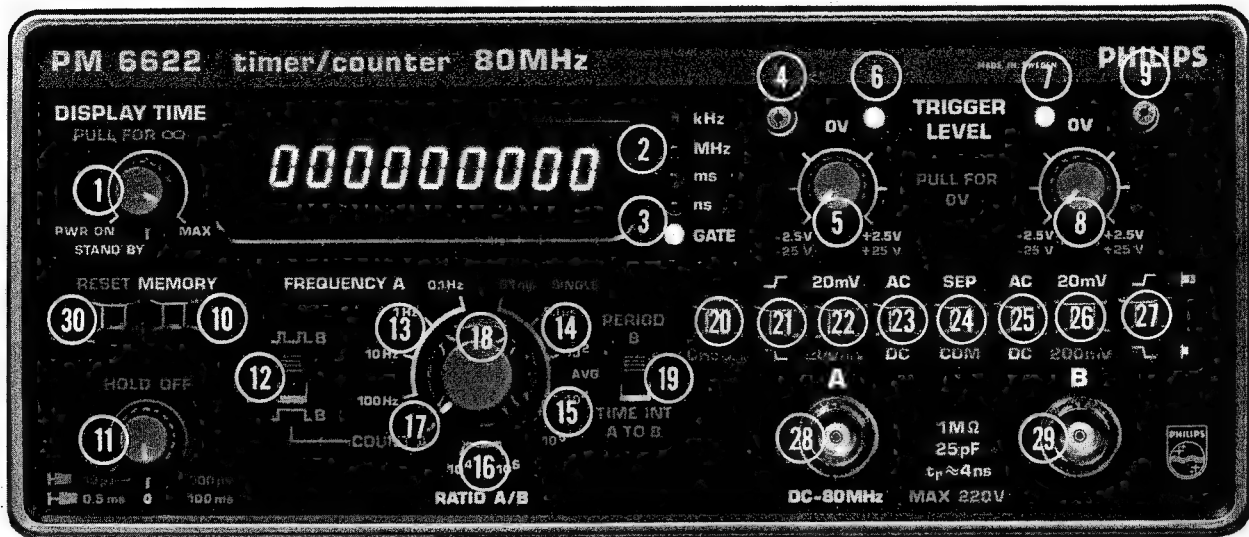
230 V



Controls, indicators and connectors PM 6622

Bedienungsorgane, Indikatoren und Anschlüsse von PM 6622

Organes de commande, connecteurs et indicateurs PM 6622



1. Display time control: Potentiometer sets display time between 0.2 s and 5 s. Infinite display time when knob is pulled. With switch set to position STAND BY the counter is turned off except of the oven oscillator.

Warning: Primary voltage of power supply is on.

2. kHz, MHz, ms and ns: Unit annunciators.

3. Gate lamp: Indicates that main-gate is opened and counting takes place, in the stand-by position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.

4. Monitor socket channel A: Output socket for set trigger level.

5. Trigger control channel A: Sets trigger level from -2.5 V to $+2.5\text{ V}$ when the attenuator is in position 20 mV, and from -25 V to $+25\text{ V}$ when the attenuator is in position 200 mV. Knob pulled sets trigger level to 0 V.

6. Trigger lamp channel A: Tri-state control lamp for set trigger level. Blinking lamp indicates that the set trigger level matches the level of the input signal. Lamp permanently on indicates that the set trigger level is too high, and lamp turned off indicates that set trigger level is too low.

7. Trigger lamp channel B: Same as trigger lamp channel A.

1. Anzeigezeit (Display time): Potentiometer-Einstellung der Anzeigezeit zwischen 0,2 und 5 s. Unbegrenzte Anzeigezeit bei gezogenem Knopf. In Stellung STAND BY wird der Zähler mit Ausnahme des geheizten Oszillators abgeschaltet.

Warnung: Primärspannung des Netzteils ist eingeschaltet.

2. kHz, MHz, ms und ns: Anzeige der eingestellten Meßeinheit.

3. Lampe GATE: Zeigt, an, daß das Haupttor offen ist und eingezählt wird. In der Stellung STAND BY zeigt diese Lampe an, daß Netz oder Batterie angeschlossen sind, um den Kristalloszillator zu stabilisieren.

4. Monitorbuchse Kanal A: Ausgang für eingestellten Triggerpegel.

5. Einstellung des Triggerpegels Kanal A: Einstellung des Triggerpegels von $-2,5\text{ V}$ bis $+2,5\text{ V}$ (Abschwächer in Stellung 20 mV) oder von -25 V bis $+25\text{ V}$ (Abschwächer in Stellung 200 mV). Durch Ziehen des Knopfes wird der Triggerpegel auf 0 V gestellt.

6. Triggerlampe Kanal A: Tristabile Anzeigelampe für den eingestellten Triggerpegel. Blinklicht zeigt an, daß der Triggerpegel auf Höhe des Eingangssignals liegt und eine Triggerung stattfindet. Leuchtet die Lampe dauernd, so ist der eingestellte Triggerpegel zu hoch, erlöscht sie ganz, ist er zu niedrig.

7. Triggerlampe Kanal B: Gleiche Funktion wie Triggerlampe Kanal A.

1. Commande du temps d'affichage: Ce potentiomètre règle le temps d'affichage entre 0.2 et 5 s. Le temps d'affichage infini est obtenu en tirant sur la commande. Avec le commutateur en position d'attente (STAND BY) le compteur est mis hors service, à l'exception de l'oscillateur à enceinte thermosta-tée.

Attention: La tension primaire de l'alimentation est en circuit!

2. KHz, MHz, ms et ns: Indicateurs d'unité.

3. Lampe de porte: Indique que la porte principale est ouverte et que le comptage a lieu. En position d'attente, la lampe de porte indique que la tension secteur ou batterie est appliquée en vue de la stabilisation de l'oscillateur cristal.

4. Douille de contrôle de la voie A: Douille de sortie pour le réglage du niveau de déclenchement.

5. Commande de déclenchement pour voie A: Règle le niveau de déclenchement de -2.5 V à $+2.5\text{ V}$ avec l'atténuateur en position 20 mV, et de -25 V à $+25\text{ V}$ avec l'atténuateur en position 200 mV. Le niveau de déclenchement est réglé sur 0 V en tirant sur la commande.

6. Lampe de déclenchement pour voie A: Lampe de contrôle (tri-state) du niveau de déclenchement réglé. Lorsque la lampe clignote, le niveau de déclenchement réglé correspond au niveau du signal d'entrée. Lorsque la lampe s'allume en permanence, le niveau est trop bas.

8. Trigger control channel B: Same as trigger control channel A.

9. Monitor socket channel B: Same as monitor socket channel A.

10. Memory: In released position the measurement information is stored until next measurement cycle is completed. Depressed button makes display follow decade counters continuously.

11. Hold off control: In Single Period Time Interval this control disables re-triggering of the main gate until the set hold off time is out.

12. Start/stop by B-Gated by B: In the upper position it sets counter to measure Count A Start-Stop by B, in the lower position counter will measure Count A Gated by B.

13. Frequency A: Sets counter to measure frequency at input A. 100 Hz, 10 Hz, 1 Hz and 0.1 Hz correspond to the resolution of the least significant digit.

14. Single: Sets counter to measure Single Period B or Single Time Interval A to B. Time resolution can be set to 0.1 ms or 0.1 μ s.

15. Average: Sets counter to measure Multiple Period B or Time Interval Average A to B. 10^2 , 10^4 and 10^6 are number of averagings.

16. Ratio A/B: Sets counter to measure ratio between signals at input A and B. 10^4 and 10^6 are multipliers.

17. Count A: Sets counter to accumulate pulses between Start to Stop or Gated by B measurements.

18. Function selector: Combined with the two slide switches it selects the different measuring modes.

19. Period B/Time interval A to B: Sets counter to measure Period B or Time interval A to B.

20. Self check: Connects 10 MHz from the internal oscillator to the input circuits of the counter.

21. Slope selector channel A: Sets counter to trigger on either positive or negative slope of the input signal.

22. Attenuator channel A: Provides $10\times$ attenuation of the input signal.

23. AC/DC selector channel A: Selects AC or DC coupling of the input signal.

8. Einstellung des Triggerpegels Kanal B: Gleiche Funktion wie für Kanal A.

9. Monitorbuchse Kanal B: Gleiche Funktion wie Monitorbuchse Kanal A.

10. MEMORY (Speicher): In ausgelöster Stellung wird die Meßinformation bis Ende des nächsten Meßzyklus gespeichert. Bei eingedrückter Taste folgt die Anzeige kontinuierlich den Dekadenzählern.

11. HOLD OFF (Triggersperre): Bei Messung von Einzelperiode und Einzel-Zeitintervall verhindert HOLD OFF die Triggerung des Haupttors vor Ablauf der eingestellten Haltezeit.

12. Start/Stopp und Torsteuerung durch B: In der oberen Schalterstellung ist das Gerät auf Zählung A, Start/Stopp durch B eingestellt, in der unteren auf Zählung A und Torsteuerung durch B.

13. Frequenz A: Einstellung des Zählers auf Frequenzmessungen an Eingang A; 100 Hz, 10 Hz, 1 Hz und 0,1 Hz bezeichnen die Auflösung der niedrigsten Stelle.

14. SINGLE: Einstellung auf Messung von Einzelperiode B oder Einzel-Zeitintervall A-B. Zeitaufösung einstellbar auf 0,1 ms oder 0,1 μ s.

15. AVG (Mittelwert): Einstellung auf Messung der Vielfachperiode B oder des Zeitintervall-Mittelwerts A-B. Anzahl der Meßperioden einstellbar auf 10^2 , 10^4 und 10^6 .

16. RATIO A/B: Zählereinstellung auf Verhältnismessung zwischen Signalen am Eingang A und Eingang B. Wählbare Multiplikatoren 10^4 und 10^6 .

17. COUNT A: Einstellung des Zählers zum Summieren von Impulsen bei Start/Stopp oder Torsteuerung durch B.

18. Funktionswähler: Zusammen mit den beiden Schiebeschaltern werden hier die verschiedenen Meßarten gewählt.

19. PERIOD B/TIME INTERVAL A TO B: Einstellung des Zählers auf Messung von Periode B oder Zeitintervall A-B.

20. CHECK (Eigenkontrolle): Verbindet 10-MHz-Signale vom internen Oszillator mit den Eingangskreisen des Zählers.

21. Flankenwählschalter Kanal A: Einstellung der Triggerung auf negative oder positive Flanke des Eingangssignals.

22. Abschwächung Kanal A: 10-fache Abschwächung des Eingangssignals.

7. Lampe de déclenchement pour voie B: Identique à la lampe de déclenchement pour voie A.

8. Commande de déclenchement pour voie B: Identique à la commande de déclenchement pour voie A.

9. Douille de contrôle pour voie B: Identique à la douille de contrôle de la voie A.

10. Mémoire: En position relâchée, l'information de mesure est stockée jusqu'à ce que le cycle de mesure suivant soit accompli. En position enfoncée, l'affichage suit continuellement les compteurs à décade.

11. Retard de déclenchement (HOLD OFF): En mode période simple et intervalle de temps simple, cette commande empêche un déclenchement intempestif de la porte principale jusqu'à ce que le temps du retard de déclenchement soit écoulé.

12. Démarrage/arrêt par B/ Déclenchement par B: En position supérieure, le compteur mesure le comptage A — démarrage/arrêt par B. En position inférieure, le compteur mesure le comptage A — déclenchement par B.

13. Fréquence A: Positionne le compteur pour mesure de fréquence à l'entrée A. 100 Hz, 10 Hz, 1 Hz et 0.1 Hz correspondent à la résolution du chiffre le moins significatif.

14. Simple ("SINGLE"): Positionne le compteur pour mesure de période simple B ou intervalle de temps simple A à B. La résolution de temps peut être réglée sur 0.1 ms ou 0.1 μ s.

15. Moyenne ("AVG."): Positionne le compteur pour mesure du période-multiple B ou intervalle de temps moyen de A à B. Les moyennes 10^2 , 10^4 et 10^6 , sont possibles.

16. Rapport A/B ("RATIO A/B"): Positionne le compteur pour mesure du rapport entre les signaux d'entrée A et B. Les multiplicateurs 10^4 et 10^6 sont possibles.

17. Comptage A: Positionne le compteur pour accumuler les impulsions entre les mesures démarrage-arrêt ou déclenchement par B.

18. Sélecteur de fonctions: Combiné avec les deux commutateurs linéaires, il permet la sélection des différents modes de mesure.

19. Période B/ Intervalle de temps A à B ("PERIOD B/TIME INT. A TO B"): Positionne le compteur pour mesure de période B, ou intervalle de temps A à B.

20. Auto Contrôle: Connecte le 10 MHz de l'oscillateur interne aux circuits d'entrée du compteur.

24. Separate/Common via B: Connects channel A and B internally in position COM VIA B. In position SEP the input channels are separated.

25. AC/DC selector channel B: Same as AC/DC selector channel A.

26. Attenuator channel B: Same as attenuator channel A.

27. Slope selector channel B: Same as slope selector channel A.

28. Input A: Input socket for frequency, ratio and time interval measurement.

29. Input B: Input socket for period, ratio and time interval measurement.

30. Reset: Resets counter and display to zero.

23. AC/DC-Wählschalter Kanal A: Wahl von AC- oder DC-Kopplung des Eingangssignals.

24. SEP/COM über B: In Stellung COM VIA B werden Kanal A und Kanal B intern verbunden. In Stellung SEP sind die beiden Eingangskanäle getrennt.

25. AC/DC-Wählschalter Kanal B: Siehe AC/DC-Wählschalter Kanal A.

26. Abschwächung Kanal B: Siehe Abschwächung Kanal A.

27. Flankenwählschalter Kanal B: Siehe Flankenwählschalter Kanal A.

28. Eingang A: Eingangsbuchse für Frequenz-, Verhältnis- und Zeitintervallmessungen.

29. Eingang B: Eingangsbuchse für Perioden-, Verhältnis- und Zeitintervallmessungen.

30. RESET: Rückstellung von Zähler und Anzeige auf Null.

21. Sélecteur de pente pour voie A : Positionne le compteur pour déclencher sur pente positive ou négative du signal d'entrée.

22. Atténuateur pour voie A : Fournit une atténuation $10 \times$ du signal d'entrée.

23. Sélecteur AC/DC pour voie A : Sélectionne le couplage capacitif ou continu du signal d'entrée.

24. Séparé/Commun par B ("SEP/COM") : Connecte les voies A et B à l'intérieur en position COM VIA B. En position SEP, les voies d'entrée sont séparées.

25. Sélecteur AC/DC pour voie B : Identique au sélecteur AC/DC pour voie A.

26. Atténuateur voie B : Identique à l'atténuateur voie A.

27. Sélecteur de pente pour voie B : Identique au sélecteur de pente pour voie A.

28. Entrée A : Douille d'entrée pour mesure de fréquence, de rapport et d'intervalle de temps.

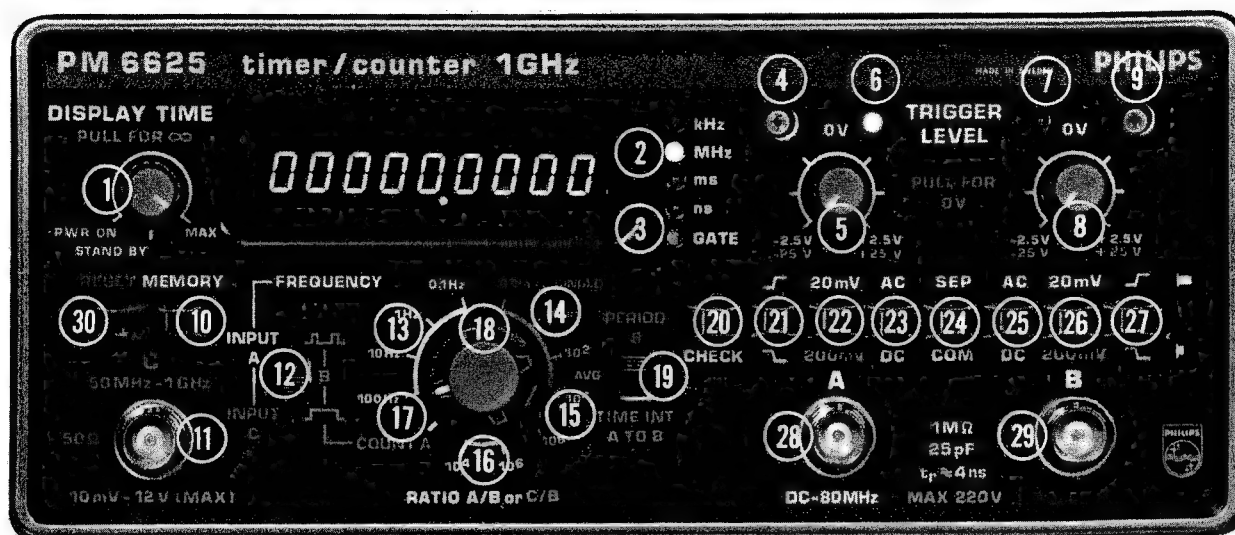
29. Entrée B : Douille d'entrée pour mesure de période, de rapport et d'intervalle de temps.

30. Remise à zéro : Remet le compteur et l'affichage à zéro.

Controls, indicators and connectors PM 6624 and PM 6625

Bedienungsorgane, Indikatoren und Anschlüsse von PM 6624 und PM 6625

Organes de commande, connecteurs et indicateurs PM 6624 et PM 6625



1. Display time control: Potentiometer sets display time between 0.2 and 5 s. Infinite display time when knob is pulled. With switch set to position STAND BY the counter is turned off except of the oven oscillator.

Warning: Primary voltage of power supply is on.

2. kHz, MHz, ms and ns: Unit annunciators.

3. Gate lamp: Indicates that main-gate is opened and counting takes place, in the stand-by position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.

4. Monitor socket channel A: Output socket for set trigger level.

5. Trigger control channel A: Sets trigger level from -2.5 V to $+2.5\text{ V}$ when the attenuator is in position 20 mV, and from -25 V to $+25\text{ V}$ when the attenuator is in position 200 mV. Knob pulled sets trigger level to 0 V.

6. Trigger lamp channel A: Tri-state control lamp for set trigger level. Blinking lamp indicates that the set trigger level matches the level of the input signal. Lamp permanently on indicates that the set trigger level is too high, and lamp turned off indicates that set trigger level is too low.

7. Trigger lamp channel B: Same as trigger lamp channel A.

1. Anzeigzeit (Display time): Potentiometer-Einstellung der Anzeigzeit zwischen 0,2 und 5 s. Unbegrenzte Anzeigzeit bei gezogenem Knopf. In Stellung STAND BY wird der Zähler mit Ausnahme des geheizten Oszillators abgeschaltet.

Warnung: Primärspannung des Netzteils ist eingeschaltet.

2. kHz, MHz, ms und ns: Anzeige der eingestellten Maßeinheit.

3. Lampe GATE: Zeigt an, daß das Haupttor offen ist und eingezählt wird. In der Stellung STAND BY zeigt diese Lampe an, daß Netz oder Batterie angeschlossen sind, um den Kristalloszillator zu stabilisieren.

4. Monitorbuchse Kanal A: Ausgang für eingestellten Triggerpegel.

5. Einstellung des Triggerpegels Kanal A: Einstellung des Triggerpegels von $-2,5\text{ V}$ bis $+2,5\text{ V}$ (Abschwächer in Stellung 20 mV) oder von -25 V bis $+25\text{ V}$ (Abschwächer in Stellung 200 mV). Durch Ziehen des Knopfes wird der Triggerpegel auf 0 V gestellt.

6. Triggerlampe Kanal A: Tristabile Anzeigelampe für den eingestellten Triggerpegel. Blinklicht zeigt an, daß der Triggerpegel auf Höhe des Eingangssignals liegt und eine Triggerung stattfindet. Leuchtet die Lampe dauernd, so ist der eingestellte Triggerpegel zu hoch, erlischt sie ganz, ist er zu niedrig.

1. Commande du temps d'affichage : Ce potentiomètre règle le temps d'affichage entre 0.2 s et 5 s. On obtient le temps d'affichage infini en tirant sur la commande. En position d'attente (STAND BY) le compteur est mis hors service à — l'exception de l'oscillateur à enceinte thermostatée.

Attention : La tension primaire de l'alimentation est en circuit !

2. KHz, MHz, ms et ns : Indicateurs d'unité.

3. Lampe de porte : Indique que la porte principale est ouverte et que le comptage a lieu ; en position d'attente, la lampe de porte indique que la tension secteur ou batterie est appliquée en vue de la stabilisation de l'oscillateur cristal.

4. Douille de contrôle de la voie A : Douille de sortie pour le réglage du niveau de déclenchement.

5. Commande de déclenchement pour voie A : Règle le niveau de déclenchement de -2.5 V à $+2.5\text{ V}$ avec atténuateur en position 20 mV et de -25 V à $+25\text{ V}$ avec atténuateur en position 200 mV. Le niveau de déclenchement est réglé sur 0 V en tirant sur ce bouton.

6. Lampe de déclenchement pour voie A : Lampe de contrôle (tri-state) du niveau de déclenchement réglé. Lorsque la lampe clignote, le niveau de déclenchement réglé correspond au niveau du signal d'entrée. Lorsque la lampe est allumée en permanence, le niveau de déclenchement est trop

8. Trigger control channel B: Same as trigger control channel A.

9. Monitor socket channel B: Same as monitor socket channel A.

10. Memory: In released position the measurement information is stored until next measurement cycle is completed. Depressed button makes display follow decade counters continuously.

11. Input C: Input socket for frequency and ratio measurement.

12. Start-Stop by B/Gated by B and Input A/Input C: In the upper position it sets counter to measure Count A Start-Stop by B, Frequency A, or Ratio A/B and in the lower position it sets counter to measure Count A Gated by B, Frequency C or Ratio C/B depending on how the Function Selector is set.

13. Frequency A and C: Sets counter to measure frequency at inputs A and C. 100 Hz, 10 Hz, 1 Hz and 0.1 Hz correspond to the resolution of the least significant digit.

14. Single: Sets counter to measure Single Period B or Single Time Interval A to B. Time resolution can be set to 0.1 ms or 0.1 μ s.

15. Average: Sets counter to measure Multiple Period B or Time Interval average A to B. 10^2 , 10^4 and 10^6 are number of averagings.

16. Ratio A/B or C/B: Combined with Input A/Input C switch it selects Ratio A/B or Ratio C/B measurement. 10^4 and 10^6 are multipliers.

17. Count A: Sets counter to accumulate pulses between Start to Stop or Gated by B measurements.

18. Function selector: Combined with the two slide switches it selects the different measuring modes.

19. Period B/Time interval A to B: Sets counter to measure Period B or Time Interval A to B.

20. Self check: Connects 10 MHz from the internal oscillator to the input circuits of the counter.

21. Slope selector channel A: Sets counter to trigger on either positive or negative slope of the input signal.

22. Attenuator channel A: Provides $10\times$ attenuation of the input signal.

7. Triggerlampe Kanal B: Gleiche Funktion wie Triggerlampe Kanal A.

8. Einstellung des Triggerpegels Kanal B: Gleiche Funktion wie für Kanal A.

9. Monitorbuchse Kanal B: Gleiche Funktion wie Monitorbuchse Kanal A.

10. MEMORY (Speicher): Bei gelöster Taste wird die Meßinformation bis Ende des nächsten Meßzyklus gespeichert. Bei eingedrückter Taste folgt die Anzeige kontinuierlich den Dekadenzählern.

11. Eingang C: Eingangsbuchse für Frequenz- und Verhältnismessung.

12. Start/Stopp und Torsteuerung durch B sowie INPUT A/INPUT C: In der oberen Schalterstellung ist das Gerät auf Zählung A (Start/Stopp durch B), Frequenz A oder Verhältnis A/B eingestellt. In der unteren Schalterstellung hingegen auf Zählung A (Torsteuerung durch B), Frequenz C oder Verhältnis C/B — je nach Einstellung des Funktionswählers.

13. Frequenz A und C: Einstellung auf Frequenzmessungen an den Eingängen A und C; 100 Hz, 10 Hz, 1 Hz und 0,1 Hz bezeichnen die Auflösung der niedrigsten Stelle.

14. SINGLE: Einstellung auf Messung der Einzelperiode B oder des Einzelzeitintervalls A-B. Zeitauflösung einstellbar auf 0,1 ms oder 0,1 μ s.

15. AVG (Mittelwert): Einstellung auf Messung der Vielfachperiode B oder des Zeitintervall-Mittelwerts A-B. Anzahl der Meßperioden einstellbar auf 10^2 , 10^4 und 10^6 .

16. RATIO A/B or C/B: Zusammen mit dem Schalter INPUT A/INPUT C wird hier zwischen Verhältnismessung A/B oder C/B gewählt. 10^4 und 10^6 sind wählbare Multiplikatoren.

17. COUNT A: Einstellung des Zählers zum Summieren von Impulsen bei Start/Stopp oder Torsteuerung durch B.

18. Funktionswähler: Zusammen mit den beiden Schiebeschaltern werden hier die verschiedenen Meßarten gewählt.

19. PERIOD B/TIME INTERVAL A TO B: Einstellung des Zählers auf Messung von Periode B oder Zeitintervall A-B.

20. CHECK (Eigenkontrolle): Verbindet 10-MHz-Signale vom internen Oszillator mit den Eingangskreisen des Zählers.

erhöht, par contre, si la lampe s'éteint ce niveau est trop bas.

7. Lampe de déclenchement pour voie B: Identique à la lampe de déclenchement pour voie A.

8. Commande de déclenchement pour voie B: Identique à la commande de déclenchement pour voie A.

9. Douille de contrôle de la voie B: Identique à la douille de contrôle de la voie A.

10. Mémoire: En position relâchée, l'information de mesure est stockée jusqu'à ce que le cycle de mesure suivant soit accompli. En position enfoncée, l'affichage suit continuellement les compteurs à decade.

11. Entrée C: Douille d'entrée pour mesure de fréquence et de rapport.

12. Démarrage/Arrêt par B/Déclenchement par B et Entrée A/Entrée C: En position supérieure, le compteur mesure le comptage A — démarrage/arrêt par B, la fréquence ou le rapport A/B. En position inférieure, le compteur mesure le comptage A — déclenchement par B, la fréquence C ou le rapport C/B selon la position du sélecteur de fonctions.

13. Fréquence A et C: Positionne le compteur pour mesurer la fréquence aux entrées A et C. 100 Hz, 10 Hz, 1 Hz et 0.1 Hz correspondent à la résolution du chiffre le moins significatif.

14. Simple (SINGLE): Positionne le compteur pour mesurer la période simple B, ou l'intervalle de temps simple de A à B. La résolution de temps peut être réglée sur 0.1 ms ou 0.1 μ s.

15. Moyenne (AVG.): Positionne le compteur pour mesurer la période multiple B, ou la moyenne de l'intervalle de temps A à B, 10^2 , 10^4 et 10^6 , sont le nombre de moyennes possibles.

16. Rapport A/B ou C/B: Combinée avec entrée A/entrée C, cette position permet de mesurer le — rapport A/B ou le rapport C/B. Les multiplicateurs 10^4 et 10^6 sont possibles.

17. Comptage A: Positionne le compteur pour accumuler les impulsions entre les mesures démarrage — arrêt ou déclenchement par B.

18. Sélecteur de fonctions: Combiné avec les deux commutateurs à coulisse, il sélectionne les différents modes de mesure.

19. Période B/Intervalle de temps A à B ("PERIOD B/ TIME INT. A TO B"): Positionne le compteur pour mesurer la période B ou l'intervalle de temps — A à B.

23. AC/DC selector channel A: Selects AC or DC coupling of the input signal.

24. Separate/Common via B: Connects channel A and B internally in position COM VIA B. In position SEP the input channels are separated.

25. AC/DC selector channel B: Same as AC/DC selector channel A.

26. Attenuator channel B: Same as attenuator channel A.

27. Slope selector channel B: Same as slope selector channel A.

28. Input A: Input socket for frequency, ratio and time interval measurement.

29. Input B: Input socket for period, ratio and time interval measurement.

30. Reset: Resets counter and display to zero.

21. Flankenwählschalter Kanal A: Einstellung der Triggerung auf negative oder positive Flanke des Eingangssignals.

22. Abschwächung Kanal A: 10-fache Abschwächung des Eingangssignals.

23. AC/DC-Wählschalter Kanal A: Wahl von AC- oder DC-Kopplung des Eingangssignals.

24. SEP/COM über B: In Stellung COM VIA B werden Kanal A und Kanal B intern verbunden. In Stellung SEP sind die beiden Eingangskanäle getrennt.

25. AC/DC-Wählschalter Kanal B: Siehe AC/DC-Wählschalter Kanal A.

26. Abschwächung Kanal B: Siehe Abschwächung Kanal A.

27. Flankenwählschalter Kanal B: Siehe Flankenwählschalter Kanal A.

28. Eingang A: Eingangsbuchse für Frequenz-, Verhältnis- und Zeitintervallmessungen.

29. Eingang B: Eingangsbuchse für Perioden-, Verhältnis- und Zeitintervallmessungen.

30. RESET: Rückstellung von Zähler und Anzeige auf Null.

20. Auto Contrôle : Connecte le 10 MHz de l'oscillateur interne aux circuits d'entrée du compteur.

21. Sélecteur de pente pour voie A : Positionne le compteur pour déclencher sur la pente positive ou négative du signal d'entrée.

22. Atténuateur voie A : Fournit une atténuation $10 \times$ du signal d'entrée.

23. Sélecteur AC/DC pour voie A : Sélectionne le couplage capacitif ou continu du signal d'entrée.

24. Séparé/Commun par B ("SEP/COM") : Connecte les voies A et B à l'intérieur en position COM VIA B. En position SEP, les voies d'entrée sont séparées.

25. Sélecteur AC/DC pour voie B : Identique au sélecteur AC/DC pour voie A.

26. Atténuateur pour voie B : Identique à l'atténuateur pour voie A.

27. Sélecteur de pente pour voie B : Identique au sélecteur de pente pour voie A.

28. Entrée A : Douille d'entrée pour mesure de fréquence, de rapport et d'intervalle de temps.

29. Entrée B : Douille d'entrée pour mesure de période, de rapport et d'intervalle de temps.

30. Remise à zéro : Remet le compteur et l'affichage à zéro.

Controls and connectors

Bedienungsorgane
und AnschlüsseOrganes de commande
et connecteurs

1. External battery socket: Plus pole input socket for external battery.

2. Mains Input: Input socket for the mains.

3. External reset input: Input socket for reset/start signal.

4. Monitor socket gate signal: Output socket for gate and hold off (PM 6622) signals.

5. Internal/External Standard switch: Sets operating mode of input D to either internal 10 MHz out or external 10 MHz in.

6. External battery socket: Minus pole input socket for external battery.

7. Chassis ground: Protective earth terminal.

8. Mains/Battery switch: Sets power supply to be fed from external or internal power source.

9. BCD and D/A connector: Output connector for the BCD and D/A units.

10. Internal/External Standard socket: 10 MHz out or external 10 MHz in.

1. Buchse für externe Batterie: Plus-pol zum Anschluß der externen Batterie.

2. Netzeingang: Anschluß des Netzkabels.

3. Buchse für externe Rückstellung: Eingang für externe Rückstell-/Startsignale.

4. Monitorbuchse für Torsignale: Ausgang für Tor- und HOLD OFF-Signale (letztere nur PM 6622).

5. Schalter INT. STD./EXT. STD.: Einstellung der Betriebsart von Eingang D auf interne 10 MHz oder externe 10 MHz.

6. Buchse für externe Batterie: Minus-pol zum Anschluß der externen Batterie.

7. Gehäuseerdung: Schutzterdungsklemme.

8. Umschalter Netz/Batterie: Einstellung auf Netz- oder Batteriespeisung des Geräts.

9. Buchse für BCD und D/A: Ausgang für BCD-Steckkarte oder D/A-Wandler.

10. Buchse für internen/externen Standard: 10-MHz-Ausgang oder externer 10-MHz-Eingang.

1. Douille pour batterie externe: Douille d'entrée à pôle positif pour batterie externe.

2. Entrée secteur: Douille d'entrée secteur.

3. Entrée de remise à zéro externe: Douille d'entrée pour remise à zéro/signal de démarrage.

4. Douille de contrôle pour signal de porte: Douille de sortie pour — signaux de porte et de retard de déclenchement (PM 6622).

5. Commutateur standard interne/externe: Commute soit l'oscillateur interne, soit l'oscillateur externe, avec entrée ou sortie de la fréquence 10 MHz, sur la douille D.

6. Douille pour batterie externe: Douille d'entrée à pôle négatif, pour batterie externe.

7. Prise de terre: Protection terre.

8. Commutateur secteur/batterie: Règle l'alimentation pour source interne ou externe.

9. Connecteur BCD et D/A: Connecteur de sortie pour unités BCD et D/A.

10. Douille standard interne/externe: Sortie du signal 10 MHz, ou entrée du signal 10 MHz externe.

Operation

Mains: Before the counter is connected to the mains check that the mains transformer is wired for the local mains voltage as described in chapter Installation.

— Set switch MAINS EXT. BATT/INT. BATT on the rear panel to position MAINS EXT. BATT.

— Connect the mains cable to input socket for the mains at the rear panel.

— Set DISPLAY TIME control at the front panel to position ON.

— Check that display turns on indicating that power is on.

External battery: Set switch MAINS EXT. BATT/INT. BATT at the rear panel to position MAINS EXT. BATT.

— Connect the cables from the external battery to sockets EXT. BATT. 12—28 V at the rear panel.

— Set DISPLAY TIME at the front panel control to position ON.

— Check that display turns on indicating that power is on.

Internal battery PM 9673: Set switch MAINS EXT. BATT/INT. BATT. at the rear panel to position INT. BATT.

— Set DISPLAY TIME control at the front panel to position ON.

— Check that display turns on indicating that power is on. Blinking display indicates low voltages. Refer to manual PM 9673 for charging instructions.

Warm up time: The warm up time from the moment of mains connection is less than 7 minutes to an oscillator error of less than 10^{-7} for instruments equipped with the oven enclosed oscillator PM 9690. Instruments equipped with the oscillators PM 9677 or PM 9678 (TCXO) are ready for use at the moment of mains connection.

Normally the instrument is switched on from the STAND BY position. If so, no warm up time is needed, irrespective of which oscillator is employed.

External frequency standards: House standards or other frequency standards can be used instead of the internal 10 MHz oscillator.

If a time resolution of 100 ns is required, 10 MHz must be used. When using 1 MHz instead of 10 MHz the decimal point must be shifted one step to the left to interpret the display correctly. To set the counter to external standard the switch INT. STD OUT VIA D/EXT. STD IN VIA D at the rear panel must be set to position EXT. STD IN VIA D.

Betrieb

Netzanschluß: Vor Anschluß des Zählers an das Netz überzeuge man sich, daß der Netztrafo der örtlichen Spannung entsprechend verdrahtet ist (vgl. Abschnitt „Installation“).

— Schalter MAINS EXT. BATT/INT. BATT auf der Rückseite des Geräts auf MAINS EXT. BATT stellen.

— Netzkabel auf der Rückseite einstecken.

— Einsteller DISPLAY TIME auf ON stellen.

— Kontrollieren, ob die Anzeige aufleuchtet und das Gerät somit eingeschaltet ist.

Externe Batterie: Schalter MAINS EXT. BATT/INT. BATT auf der Rückseite des Geräts auf MAINS EXT. BATT stellen.

— Anschlußkabel der externen Batterie in die Buchsen EXT. BATT 12—28 V auf der Rückseite stecken.

— Einsteller DISPLAY TIME auf ON stellen.

— Kontrollieren, ob die Anzeige aufleuchtet und das Gerät somit eingeschaltet ist.

Interne Batterie PM 9673: Schalter MAINS EXT. BATT/INT. BATT auf der Geräte-Rückseite auf INT. BATT stellen.

— Einsteller DISPLAY TIME auf ON stellen.

— Kontrollieren, ob die Anzeige aufleuchtet und das Gerät somit eingeschaltet ist. Blinkende Anzeige bedeutet zu niedrige Spannung. Anweisungen zur Aufladung der Batterie enthält das Handbuch PM 9673.

Aufwärmzeit: Die Aufwärmzeit vom Netzanschluß bis zur Erreichung einer Oszillator-Fehlergrenze von unter 10^{-7} beträgt bei Geräten mit dem geheizten Oszillator PM 9690 weniger als 7 Minuten. Zähler mit den Oszillatoren PM 9677 oder PM 9678 (TCXO) sind sofort nach Netzanschluß betriebsbereit.

Gewöhnlich wird das Instrument aus der Stellung STAND BY eingeschaltet. In diesem Fall ist keine Aufwärmzeit erforderlich, gleichgültig welcher Oszillator verwendet wird.

Externe Frequenzstandards: Anstelle des 10-MHz-Oszillators können auch andere Frequenzstandards verwendet werden.

Um eine Zeitauflösung von 100 ns zu erreichen, sind jedoch 10 MHz unbedingt erforderlich. Bei Verwendung von

Mise en service

Secteur : Avant de brancher le compteur au secteur, vérifier si le — transformateur secteur est connecté pour la tension secteur locale, comme décrit au chapitre INSTALLATION.

— Mettre le commutateur MAINS EXT. BATT/INT. BATT du panneau arrière, en position MAINS EXT. BATT.

— Connectez le câble secteur à la douille d'entrée secteur à l'arrière.

— Réglez la commande DISPLAY TIME (panneau avant) sur position ON.

— Vérifier si l'affichage s'allume, indiquant ainsi que l'appareil est branché.

Batterie externe : Mettre le commutateur MAINS EXT. BATT/INT. BATT (panneau arrière) en position MAINS EXT. BATT.

— Connecter les câbles de la batterie externe aux douilles EXT. BATT. 12—28 V (panneau arrière).

— Mettre la commande DISPLAY TIME (panneau avant) en position ON.

— Vérifier si l'affichage s'allume, indiquant ainsi que l'appareil est branché.

Batterie interne PM 9673 : Mettre le commutateur MAINS EXT. BATT/INT. BATT (panneau arrière) en position INT. BATT.

— Mettre la commande DISPLAY TIME (panneau avant) en position ON.

— Vérifier que l'affichage s'allume, indiquant ainsi que l'appareil est branché. Si l'affichage clignote, cela signifie que les batteries sont presque déchargées. Voir la notice PM 9673 pour instructions de charge.

Temps de chauffage : Le temps de chauffage à partir du branchement au secteur est inférieur à 7 minutes avec erreur de l'oscillateur inférieure à 10^{-7} , lorsque les compteurs sont équipés de l'oscillateur à enceinte thermostatée PM 9690. Les appareils équipés des oscillateurs PM 9677 ou PM 9678 (TCXO) sont prêts à l'usage dès le branchement au secteur.

Normalement, l'appareil est enclenché en position d'attente (STAND BY). Dans ce cas, le temps de chauffage n'est pas nécessaire, quelque soit l'oscillateur utilisé.

Étalons de fréquence externe : Des étalons de fréquence externe peuvent être utilisés à la place de l'oscillateur interne 10 MHz.

Pour une résolution de temps de 100 ns, l'oscillateur à 10 MHz doit être utilisé. En cas d'application de 1 MHz au lieu de 10 MHz, le point décimal doit

A, B and C inputs: The A and B amplifiers are identical in specification and provided with identical input controls. The A input is normally used for frequency measurement and the B input for time measurement.

The C input is a prescaler input with automatic PIN-diode attenuator and mainly used for high frequency measurement.

ac and dc coupling: The ac/dc push-button controls the coupling of the input signal to the attenuator and the amplifier by switching a capacitor in series in the ac mode and by direct coupling in the dc mode.

ac coupling is normally used to block the dc component in signals which are superimposed on a ac voltage. The capacitor in series will, however, cause a falling sensitivity for low frequencies. In waveforms where pulse width and repetition time vary the dc level will also vary. Change in the dc level will cause changes in the preset triggering level and make accurate time measurements impossible if ac coupled, in such cases the input should be dc coupled. Normally frequency measurements are performed with an ac coupled input and time interval measurements with a dc coupled input.

Attenuator and Trigger Level: The TRIGGER LEVEL control allows continuous setting of the trigger level at any point of the input signal. For high amplitude signals the attenuator is used to expand the setting range.

However, input attenuation will decrease the sensitivity and cause bigger trigger errors.

For frequency measurements on sine wave and other symmetrical signals no level off-set is required. Pulled position of the TRIGGER LEVEL control sets the trigger level to 0 V for highest sensitivity.

However, for frequency measurement on narrow pulses a limited off-set voltage may be needed to obtain reliable triggering.

Time measurement requires continuously variable setting of the trigger level.

Monitor sockets for channel A and B provide the ability to measure the set trigger level.

If the attenuator is set to 200 mV the trigger level range is increased 10 times from ± 2.5 V to ± 25 V.

The name trigger level can be misleading, since triggering does not occur on the set trigger level but at the trigger point.

1 MHz anstelle von 10 MHz ist der Dezimalpunkt um eine Stelle nach links zu verschieben, um die Anzeige korrekt abzulesen. Um den Zähler auf ein externes Standardsignal einzustellen, ist der Schalter INT. STD. OUT VIA D/EXT. STD. IN VIA D in die Stellung EXT. STD. IN VIA D zu bringen.

Eingänge A, B und C: Die Verstärker A und B sind den Kenngrößen und Eingangsreglern nach identisch. Der Eingang A wird gewöhnlich für Frequenzmessungen verwendet, der Eingang B für Zeitmessungen. Der Eingang C ist ein Verteilereingang mit automatischem PIN-Dioden-Abschwächer und wird vorzugsweise zum Messen hoher Frequenzen verwendet.

AC- und DC-Kopplung: Die Drucktaste AC/DC regelt die Kopplung des Eingangssignals mit dem Abschwächer und dem Verstärker durch Serienschaltung eines Kondensators im AC-Betrieb bzw. Direktkopplung im DC-Betrieb.

Die AC-Kopplung wird gewöhnlich verwendet, um die Gleichspannungskomponente von Signalen, die einer Wechselspannung überlagert sind, zu unterdrücken. Der seriengeschaltete Kondensator verursacht jedoch eine Abnahme der Empfindlichkeit bei niedrigen Frequenzen. Bei Signalformen mit wechselnder Impulsbreite und Wiederholzeit wechselt auch der Gleichspannungspegel. Veränderungen des Gleichspannungspegels führen wiederum zu Schwankungen des voreingestellten Triggerpegels und machen, falls AC-gekoppelt, genaue Zeitmessungen unmöglich. In solchen Fällen sollte der Eingang DC-gekoppelt sein. Normalerweise werden Frequenzmessung mit AC-gekoppeltem Eingang und Zeitintervallmessungen mit DC-gekoppeltem Eingang durchgeführt.

Abschwächer und Triggerpegel: Mit dem Potentiometer TRIGGER LEVEL läßt sich der Triggerpegel stufenlos auf jeden beliebigen Punkt des Eingangssignals einstellen. Bei hohen Amplituden wird ein Abschwächer verwendet, um den Einstellbereich zu erweitern. Eingangsdämpfung vermindert jedoch die Empfindlichkeit und verursacht größere Triggerfehler.

Für Frequenzmessungen an sinusförmigen und anderen symmetrischen Signalen ist kein Pegel-Offset erforderlich. Durch Ziehen des Knopfes TRIGGER LEVEL wird der Triggerpegel auf

être décalé d'une unité vers la gauche, afin d'interpréter — correctement l'affichage. Pour régler le compteur sur étalon externe, régler le commutateur INT. STD OUT VIA D/EXT. STD IN VIA D en position — EXT. STD IN VIA D.

Entrées A, B et C : Les amplificateurs A et B sont identiques en spécification et pourvus des mêmes commandes d'entrée.

L'entrée A est normalement utilisée pour la mesure de fréquence, et l'entrée B pour la mesure de temps.

L'entrée C est une entrée de pré-étalement avec atténuateur automatique à diodes PIN et utilisée principalement pour la mesure de haute fréquence.

Couplages capacitif et continu : Les boutons-poussoirs AC/DC contrôlent le couplage du signal d'entrée vers l'atténuateur et l'amplificateur en commutant un condensateur en série en mode AC (capacitif) et par couplage direct en mode DC (continu). Le couplage capacitif est normalement utilisé pour bloquer les — composantes continues dans les signaux superposés à une tension alternatif quoique le condensateur en série fasse décroître la sensibilité à basse fréquence.

Les formes d'onde à largeur d'impulsion et de temps de répétition variables présentent également un niveau continu variable.

Lorsque le niveau continu varie, le niveau de déclenchement pré-régulé varie également et rend les mesures de temps imprécises en couplage — capacitif. Dans de tels cas, l'entrée doit être couplée en continu. Normalement les mesures de fréquence sont effectuées avec une entrée en couplage capacitif, et les mesures d'intervalle de temps avec une entrée en couplage continu.

Atténuateur et niveau de déclenchement : La commande TRIGGER LEVEL permet le réglage continu du niveau de déclenchement en tout point du signal d'entrée. Pour les signaux à haute amplitude, l'atténuateur sert à étendre la gamme de réglage.

Cependant, l'atténuation d'entrée fait décroître la sensibilité et entraîne des erreurs de déclenchements plus importantes.

Pour des mesures de fréquence sur onde sinusoïdale et d'autres signaux symétriques, aucun offset de niveau n'est requis.

Le niveau de déclenchement est réglé

Separate and Common via B mode: In the SEP position the A and B inputs operate independently of each other in any operations irrespective of input sources. In the COM position the A input is disconnected from its attenuator and amplifier, and a signal connected to input B is coupled to both A and B attenuators and amplifiers. All input specifications of input B will remain the same but the input impedance will be 500 k Ω shunted by 50 pF.

Positive and negative slope triggering: This push-button determines on which slope of the input signal the triggering will occur.

In released position the triggering will occur at the positive slope of the input signal and in depressed position it will occur on the negative slope.

Where on the slope the triggering will occur is determined by the TRIGGER LEVEL control.

A simple way to measure the pulse width of a positive pulse is achieved by setting input A to positive slope and input B to negative slope, connect the pulse to input B, set FUNCTION SELECTOR to any of the two SINGLE positions, slide switch PERIOD B/TIME INT. A TO B to position TIME INT. A TO B and SEP/COM to COM.

Hold off PM 6622: This control provides a delayed triggering of the instrument in single period and time interval measurement, this feature is used to avoid false triggering on noisy signals.

0 V für höchste Empfindlichkeit eingestellt.

Für Frequenzmessungen an schmalen Impulsen kann jedoch eine begrenzte Offset-Spannung erforderlich sein, um eine verlässliche Triggerung zu erreichen.

Für Zeitmessungen ist eine stufenlos variable Einstellung des Triggerpegels erforderlich.

Mit Hilfe der Monitorbuchsen für Kanal A und B läßt sich der eingestellte Triggerpegel messen.

Durch Einstellung des Abschwächers auf 200 mV wird der Triggerpegelbereich zehnfach erweitert, von $\pm 2,5$ auf ± 25 V.

Die Bezeichnung Triggerpegel mag hier irreführend sein, da die Triggerung nicht am eingestellten Triggerpegel erfolgt, sondern am Triggerpunkt.

Schaltart SEP (getrennt) und COM (gemeinsam) über B: In Stellung SEP arbeiten die Eingänge A und B in jeder Betriebsart unabhängig voneinander, ungeachtet der Signalquellen. In Stellung COM ist der Eingang A von seinem Abschwächer und Verstärker getrennt, und das Signal am Eingang B wird an die Abschwächer und Verstärker beider Kanäle (A und B) gekoppelt. Alle Kenngrößen von Eingang B bleiben unverändert, doch beträgt die Eingangsimpedanz 500 k Ω , geschuntet mit 50 pF.

Triggerung auf positiver und negativer Flanke: Mit dieser Drucktaste wird die gewünschte Triggerflanke gewählt. Bei gelöster Taste erfolgt die Triggerung auf der positiven Flanke des Eingangssignals, bei gedrückter Taste auf der negativen Flanke.

An welchem Punkt die Triggerung erfolgt, hängt von der Einstellung des Stellknopfes TRIGGER LEVEL ab.

Die Breite eines positiven Impulses läßt sich auf einfache Weise wie folgt messen: Eingang A auf positive Flanke und Eingang B auf negative Flanke einstellen, Impuls an Eingang B legen, Funktionswähler auf eine der beiden SINGLE-Funktionen, Schiebeschalter PERIOD B/TIME INT. A TO B auf TIME INT. A TO B sowie SEP/COM auf COM stellen.

Hold off (PM 6622): Dieser Einsteller ermöglicht eine verzögerte Triggerung des Geräts bei der Messung von Einzelperioden und Zeitintervallen. Dadurch werden Fehltriggerungen bei veräuschten Signalen vermieden.

sur 0 V pour une plus haute — sensibilité, en tirant sur la commande TRIGGER LEVEL.

Cependant, pour la mesure de fréquence en impulsions étroites une tension d'offset limitée peut être requise afin d'obtenir un déclenchement fiable. La mesure de temps requiert un réglage continuellement variable du niveau de déclenchement.

Les douilles de contrôle pour les voies A et B permettent de mesurer le niveau de déclenchement exact.

Si l'atténuateur est réglé sur 200 mV, la gamme du niveau de déclenchement est accrue de 10 fois de $\pm 2,5$ V à ± 25 V.

La dénomination "niveau de déclenchement" peut sembler abusive, car le déclenchement n'a pas lieu au niveau de déclenchement réglé, mais au point de déclenchement.

Modes d'entrée Séparée et Commune par B : En position SEP les entrées A et B fonctionnent indépendamment l'une de l'autre sans tenir compte des fonctions, ni des sources d'entrée. En position COM, l'entrée A est déconnectée de son atténuateur et de son amplificateur, et un signal connecté à l'entrée "B" est couplé aux atténuateurs et amplificateurs A et B.

Toutes les spécifications d'entrée B restent identiques, si ce n'est que l'impédance d'entrée qui est de 500 k Ω déviée à travers 50 pF.

Déclenchement sur pente positive et négative : Ce bouton-poussoir détermine sur quelle pente du signal d'entrée, aura lieu le déclenchement.

En position relâchée le déclenchement a lieu sur la pente positive du signal d'entrée, et en position enfoncée, le déclenchement a lieu sur la pente négative.

Le point de déclenchement est déterminé par la commande TRIGGER LEVEL. La largeur d'une impulsion positive peut être mesurée en réglant l'entrée A sur pente positive et l'entrée B sur pente négative, connecter ensuite l'impulsion à l'entrée B, régler le sélecteur de fonctions sur une des deux positions SINGLE, coulisser le commutateur PERIOD B/TIME INT. A TO B en position TIME INT. A TO B et SEP/COM sur COM.

Retard de déclenchement sur PM 6622 : Cette commande permet le déclenchement retardé de l'appareil pour mesure de période simple et d'intervalle de temps, et ce afin d'éviter un faux déclenchement sur des signaux bruités.

Period B

Simple period measurement on sine waves and other symmetrical waveforms.

- Set FUNCTION SELECTOR to SINGLE or AVG measurement
 - Set PERIOD B/TIME INT. A TO B to PERIOD B
 - Pull TRIGGER LEVEL
 - Set AC/DC to AC
 - Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than $1 V_{rms}$
 - Select positive slope triggering
 - Connect the signal to input B
- Display will show period time in ms or ns

Time Interval A to B

Simple measurement of time interval between pulses at input A and B from separate sources.

- Set FUNCTION SELECTOR to SINGLE or AVG
 - Set PERIOD B/TIME INT. A TO B to TIME INT. A TO B
 - Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than $3 V_{p-p}$
 - Set AC/DC to DC
 - Set SEP/COM to SEP
 - Select positive slope triggering
 - Set TRIGGER LEVEL potentiometer to suitable trigger level e.g. 50 % of the pulse amplitude
 - Connect the pulses to input A and B
- Display will show the time interval in ms or ns

Ratio A/B

Simple ratio measurement on sine wave or other symmetrical waveforms.

- Set FUNCTION SELECTOR to 10^4 or 10^6
 - Pull TRIGGER LEVEL control
 - Set AC/DC to AC
 - Set SEP/COM to SEP
 - Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than $1 V_{rms}$
 - Connect the signal with the highest frequency to input A and the other signal to input B
- Display will show the ratio of the signal frequencies at input A and B

Ratio C/B PM 6624 and PM 6625

Simple ratio measurement on sine wave and other symmetrical waveforms.

- Set FUNCTION SELECTOR to 10^4 or 10^6
- Set INPUT A/INPUT C to INPUT C
- Pull TRIGGER LEVEL control
- Set SEP/COM to SEP
- Set AC/DC to AC
- Set 20 mV/200 mV to 200 mV if the

Periode B

Einfache Periodenmessung an sinusförmigen und anderen symmetrischen Signalformen.

- Funktionswähler auf SINGLE oder AVG stellen.
- PERIOD B/TIME INT. A TO B auf PERIOD B stellen.
- Einsteller TRIGGER LEVEL ziehen.
- AC/DC auf AC stellen.
- 20 mV/200 mV auf 200 mV stellen, wenn das Eingangssignal größer ist als $1 V_{eff}$
- Triggerung auf positiver Flanke wählen.
- Signal an Eingang B legen. Die Periodendauer ist dann auf der Anzeige in ms oder ns abzulesen.

Zeitintervall A—B

Einfache Messungen des Zeitintervalls zwischen Impulsen von getrennten Quellen an Eingang A und Eingang B.

- Funktionswähler auf SINGLE oder AVG stellen.
- PERIOD B/TIME INT. A TO B auf TIME INT. A TO B stellen.
- 20 mV/200 mV auf 200 mV stellen, wenn das Eingangssignal größer ist als $3 V_{p-p}$
- AC/DC auf DC stellen.
- SEP/COM auf SEP stellen.
- Triggerung auf positiver Flanke wählen.
- Potentiometer TRIGGER LEVEL auf einen passenden Triggerpegel einstellen, z.B. 50 % der Impulsamplitude.
- Impulse an Eingang A bzw. Eingang B legen. Das Zeitintervall ist dann auf der Anzeige in ms oder ns abzulesen.

Verhältnis A/B

Einfache Verhältnismessung an sinusförmigen oder anderen symmetrischen Signalformen.

- Funktionswähler auf 10^4 oder 10^6 stellen.
 - Potentiometer TRIGGER LEVEL ziehen.
 - AC/DC auf AC stellen.
 - SEP/COM auf SEP stellen.
 - 20 mV/200 mV auf stellen, wenn das Eingangssignal größer ist als $1 V_{eff}$
 - Signal mit der höheren Frequenz an Eingang A, das andere Signal an Eingang B legen.
- Das Verhältnis der Signalfrequenzen an Eingang A und B ist dann auf der Anzeige abzulesen.

Verhältnis C/B an PM 6624 und PM 6625

Einfache Verhältnismessung an sinusförmigen oder anderen symmetrischen Signalformen.

— Connecter le signal d'entrée à l'entrée C

L'affichage indiquera la fréquence en MHz ou en KHz

Période B

Mesures de période simple sur ondes sinusoïdales et autres ondes symétriques

- Régler le sélecteur de fonctions sur SINGLE (simple) ou sur AVG (moyenne)
 - Régler PERIOD B/ TIME INT. A TO B sur PERIOD B
 - Tirer la commande TRIGGER LEVEL (niveau de déclenchement)
 - Mettre AC/DC sur AC
 - Régler 20 mV/200mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à $1 V_{eff}$
 - Sélectionner le déclenchement sur pente positive
 - Connecter le signal à l'entrée B
- L'affichage indique le temps de période en ms ou en ns

Intervalle de temps A à B

Mesure simple de temps entre impulsions aux entrées A et B à partir de sources séparées

- Mettre le sélecteur de fonctions en position SINGLE ou AVG
 - Mettre PERIOD B/TIME INT. A TO B sur TIME INT. A TO B
 - Régler 20 mV/200 mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à $3 V_{p-p}$
 - Mettre AC/DC sur DC
 - Mettre SEP/COM sur SEP
 - Sélectionner le déclenchement sur pente positive
 - Régler le potentiomètre TRIGGER LEVEL au niveau approprié, par ex 50 % de l'amplitude d'impulsion
 - Connecter les impulsions aux entrées A et B
- L'affichage indiquera l'intervalle de temps en ms ou en ns

Rapport A/B

Mesure simple de rapport sur onde sinusoïdale ou autres ondes symétriques

- Mettre le sélecteur de fonctions sur 10^4 ou 10^6
 - Tirer la commande TRIGGER LEVEL
 - Mettre AC/DC sur AC
 - Mettre SEP/COM sur SEP
 - Mettre 20 mV/200 mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à $1 V_{eff}$
 - Connecter le signal à fréquence la plus haute à l'entrée A, et l'autre signal à l'entrée B
- L'affichage indiquera le rapport des fréquences de signaux aux entrées A et B

amplitude of the input signal is higher than $1 V_{rms}$

— Connect the signal with the highest frequency to input C and the other to input B

Display will show the ratio of the signal frequencies at input C and B

Count A Start/Stop and Gated by B

Simple Start/Stop and Gated by B measurement on sine wave and other symmetrical waveforms.

— Set FUNCTION SELECTOR to COUNT A

— Pull TRIGGER LEVEL control

— Set AC/DC to AC for channel A

— Set AC/DC to DC for channel B

— Set SEP/COM to SEP

— Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than $1 V_{rms}$

— Select positive slope triggering

— Select Start/Stop by B (upper position) or Gated by B (lower position)

— Connect gating signal to input B and the other signal to input A

In Start/Stop operation the display will show the accumulated number of counts in the time interval between the Start/Stop signals, and in the Gated mode the accumulated number of counts during the positive and negative slopes of the Gating signal

Hold off PM 6622

— Set FUNCTION SELECTOR to 0.1 μs and rotate HOLD OFF control from fully CCW to fully CW position

— Read hold off time from 0.01 to 0.5 ms on the display with knob pushed and 0.5 ms to 100 ms with knob pulled

— Funktionswähler auf 10^4 oder 10^6 stellen.

— INPUT A/INPUT C auf INPUT C stellen.

— Potentiometer TRIGGER LEVEL ziehen.

— SEP/COM auf SEP stellen.

— AC/DC auf AC stellen.

— 20 mV/200 mV auf 200 mV stellen, wenn das Eingangssignal größer ist als $1 V_{eff}$.

— Signal mit der höheren Frequenz an Eingang C, das andere an Eingang B legen.

Das Verhältnis der Signalfrequenzen an Eingang C und B ist dann auf der Anzeige abzulesen.

Zählung zwischen Start/Stop oder torgesteuert von B

Einfache Zählung (Summenbildung) an sinusförmigen oder anderen symmetrischen Signalformen.

— Funktionswähler auf COUNT A stellen.

— Einsteller TRIGGER LEVEL ziehen.

— AC/DC für Kanal A auf AC stellen.

— AC/DC für Kanal B auf DC stellen.

— SEP/COM auf SEP stellen.

— 20 mV/200 mV auf 200 mV stellen, wenn das Eingangssignal größer ist als $1 V_{eff}$.

— Triggerung auf positiver Flanke wählen.

Im Start/Stop-Betrieb erscheint auf der Anzeige die zwischen Start- und Stoppsignal summierte Zahl der Impulse. Bei Torsteuerung wird die Summe der Impulse während der positiven und der negativen Flanke des Torsignals gebildet.

Triggervverzögerung PM 6622

— Funktionswähler auf 0,1 μs stellen und Einsteller HOLD OFF vom Linksanschlag bis Rechtsanschlag drehen.

— Verzögerungszeiten von 0,01 bis 0,5 ms sind dann bei eingedrücktem Knopf abzulesen, Zeiten von 0,5 bis 100 ms bei gezogenem Knopf.

Rapport C/B pour PM 6624 et PM 6625

Mesure de rapport simple sur onde sinusoïdale et autres ondes symétriques

— Mettre le sélecteur de fonctions sur 10^4 et 10^6

— Mettre INPUT A/INPUT C sur INPUT C

— Tirer la commande TRIGGER LEVEL

— Mettre SEP/COM sur SEP

— Mettre AC/DC sur AC

— Régler 20 mV/200 mV sur 200 mV si l'amplitude de signal d'entrée est supérieure à $1 V_{eff}$

— Connecter le signal à fréquence la plus haute à l'entrée C et l'autre à l'entrée B

L'affichage indiquera le rapport des fréquences de signaux aux entrées C et B

Comptage A Démarrage/arrêt et Déclenchement par B

Mesure simple arrêt/démarrage et déclenchement par B sur onde sinusoïdale et autres ondes symétriques

— Mettre le sélecteur de fonctions sur COUNT A

— Tirer la commande TRIGGER LEVEL

— Mettre AC/DC sur AC pour voie A

— Mettre AC/DC sur DC pour voie B

— Mettre SEP/COM sur SEP

— Mettre 20 mV/200 mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à $1 V_{eff}$

— Sélectionner le déclenchement sur pente positive

— Sélectionner arrêt/démarrage par B (position supérieure) ou déclenchement par B (position inférieure)

— Connecter le signal de déclenchement à l'entrée B et l'autre signal à l'entrée A

En mode démarrage/arrêt, l'affichage indique le nombre de comptages accumulés dans l'intervalle de temps entre les signaux démarrage/arrêt ; et en mode de déclenchement, l'affichage indique le nombre de comptages accumulés pendant les pentes positives et négatives du signal de déclenchement (gating)

Retard de déclenchement du PM 6622

— Mettre le sélecteur de fonctions sur 0,1 μs et tourner la commande HOLD OFF de position extrême gauche en position extrême droite.

— Lire le temps de retard de 0,01 à 0,5 ms sur l'affichage avec le bouton en position enfoncée, et de 0,5 ms à 100 ms avec le bouton en position tirée.

Performance Check

Self check of measuring modes

Preliminary setting of the controls

- Release all push-buttons
- Minimum display time
- Pull the trigger level controls
- Hold off to position off
- Internal oscillator on
- Self check on

Frequency A

- Do the preliminary setting of the controls
- Perform the test below

| Function Selector | Gate lamp | Unit lamp | Display (± 1 digit) |
|--------------------|-----------|-----------|--------------------------|
| Frequency A 100 Hz | blinking | MHz | 00010.0000 |
| Frequency A 10 Hz | blinking | MHz | 0010.00000 |
| Frequency A 1 Hz | blinking | kHz | 010000.000 |
| Frequency A 0.1 Hz | blinking | kHz | 10000.0000 |

Frequency C PM 6624

- Do the preliminary setting of the controls
- Perform the test below

| Function Selector | Gate lamp | Unit lamp | Display (± 1 digit) |
|--------------------|----------------------|-----------|--------------------------|
| Frequency C 100 Hz | blinking | MHz | 00080.0000 |
| Frequency C 10 Hz | blinking | MHz | 0080.00000 |
| Frequency C 1 Hz | blinking (slow rate) | kHz | 080000.000 |
| Frequency C 0.1 Hz | blinking (slow rate) | kHz | 80000.0000 |

Frequency C PM 6625

- Do the preliminary setting of the controls
- Perform the test below

| Function Selector | Gate lamp | Unit lamp | Display (± 1 digit) |
|--------------------|----------------------|-----------|--------------------------|
| Frequency C 100 Hz | blinking | MHz | 00160.0000 |
| Frequency C 10 Hz | blinking | MHz | 0160.00000 |
| Frequency C 1 Hz | blinking (slow rate) | kHz | 160000.000 |
| Frequency C 0.1 Hz | blinking (slow rate) | kHz | 60000.0000 |

Single Period B

- Do the preliminary setting of the controls
- Perform the test below

| Function Selector | Gate lamp | Unit lamp | Display (± 1 digit) |
|----------------------|-----------|-----------|--------------------------|
| Period B 0.1 ms | blinking | ms | 00000000.0 |
| Period B 0.1 μ s | blinking | ms | 00000.0001 |

Period Average B

- Do the preliminary setting of the controls
- Perform the test below

| Function Selector | Gate lamp | Unit lamp | Display (± 1 digit) |
|-------------------|-----------|-----------|--------------------------|
| Period B 10^2 | blinking | ns | 000000100. |
| Period B 10^4 | blinking | ns | 0000100.00 |
| Period B 10^6 | blinking | ns | 00100.0000 |

Single Time Interval A to B

- Do the preliminary setting of the controls
- Perform the test below

| Function Selector | Gate lamp | Unit lamp | Display (± 1 digit) |
|-----------------------|-----------|-----------|--------------------------|
| Time Int. 0.1 ms | blinking | ms | 00000000.0 |
| Time Int. 0.1 μ s | blinking | ms | 00000.0001 |

Time Interval Average A to B

- Do the preliminary setting of the controls
- Perform the test below

| Function Selector | Gate lamp | Unit lamp | Display (± 1 digit) |
|-------------------|-----------|-----------|----------------------------|
| Time Int. 10^2 | blinking | ns | 000000000 or any value |
| Time Int. 10^4 | blinking | ns | 0000000.00 or any value |
| Time Int. 10^6 | blinking | ns | 00000.0000 or any value |

Ratio A/B

- Do the preliminary setting of the controls
- Perform the test below

| Function Selector | Gate lamp | Unit lamp | Display (± 1 digit) |
|-------------------|-----------|-----------|--------------------------|
| Ratio A/B 10^6 | blinking | off | 001.000000 |
| Ratio A/B 10^4 | blinking | off | 0000.10000 |

Ratio C/B PM 6624

- Do the preliminary setting of the controls
- Perform the test below

| Function Selector | Gate lamp | Unit lamp | Display (± 1 digit) |
|-------------------|-----------|-----------|--------------------------|
| Ratio C/B 10^6 | blinking | off | 008.000000 |
| Ratio C/B 10^4 | blinking | off | 00008.0000 |

Performance Check



Ratio C/B PM 6625

- Do the preliminary setting of the controls
- Perform the test below

| Function Selector | Gate lamp | Unit lamp | Display (± 1 digit) |
|-------------------|-----------|-----------|--------------------------|
| Ratio C/B 10^6 | blinking | off | 016.000000 |
| Ratio C/B 10^4 | blinking | off | 00016.0000 |

Count A

- Do the preliminary setting of the controls
- Perform the test below

| Function Selector | Gate lamp | Unit lamp | Display (± 1 digit) |
|---|-----------|-----------|------------------------------|
| Count A  B | blinking | off | 000000002 |
| Count A  B | blinking | off | 000000001 or 000000000 |

Functional test of sockets and controls

Preliminary setting of the controls

- Release all push-buttons
- Minimum display time
- Pull the trigger level controls
- Hold off to position off
- Internal oscillator on

Display time

- Do the preliminary setting of the controls
- Set the function selectors to Frequency A 1 Hz
- Note that flashing frequency of the Gate lamp decreases from one flash every second to one flash every five seconds when the Display Time potentiometer is turned from the min. time position to max. time position.

Memory

- Do the preliminary setting of the controls
- Set the Function Selectors to Frequency A 1 Hz
- Set Display Time to max. position
- Observe the display and check that the counter is counting during 1 second and displays 10 000 kHz during 4 seconds when Memory push-button is depressed.

Reset

- Do the preliminary setting of the controls
- Set the Function Selectors to Frequency A 0.1 Hz
- Depress Memory push-button
- Check that counter displays zero as long as the Reset push-button is depressed.

Display digits

- This test requires a 80 MHz pulse generator
- Do the preliminary setting of the controls
- Set the function selectors to Count A Gated by B
- Depress Memory push-button
- Set Trigger Level B to +2.5 V
- Connect Sync Out from the pulse generator to Input A
- Set the pulse generator to a repetition time of 1 second
- Check that digit N:o 9 is displaying all numbers from 0 to 9 when the Trigger Level B control is set from the +2.5 V position to the -2.5 V position
- Depress Reset push-button
- Set Trigger Level B control to the +2.5 V position
- Vary the Repetition Time of the pulse generator and check the remaining 8 digits as shown in table below

| Digit N:o | 1 (MSD) | 2 | 3 | 4 |
|-----------|---------|--------|-----------|------------|
| Rep. time | 12 ns | 100 ns | 1 μ s | 10 μ s |

| Digit N:o | 5 | 6 | 7 | 8 | 9 (LSD) |
|-----------|-------------|------|-------|--------|---------|
| Rep. time | 100 μ s | 1 ms | 10 ms | 100 ms | 1 s |

Trigger Level A and B

- This test requires a voltmeter
- Do the preliminary setting of the controls
- Perform the test below

| Trigger Level A setting | Measured voltage Monitor socket A | Trigger lamp A |
|-------------------------|-----------------------------------|----------------|
| -2.5 V position | -2.3 V ... -2.7 V | off |
| +2.5 V position | +2.3 V ... +2.7 V | on |

- Repeat the test for Trigger Level B

Hold off PM 6622

- Do the preliminary setting of the controls
- Set the Function Selectors to Period B 0.1 μ s
- Perform the test below

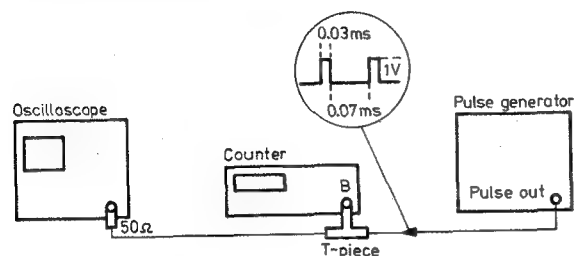
| Hold off setting | Displayed value |
|------------------|-----------------------|
| 10 μ s | less than 10 μ s |
| 500 μ s | more than 500 μ s |
| 0.5 ms | less than 500 μ s |
| 100 ms | more than 100 ms |

Performance Check

Positive and negative slopes A and B

This test requires a low frequency oscilloscope, a pulse generator and a BNC T-piece.

- Do the preliminary setting of the controls
- Set Function Selectors to Time Interval 0.1 μ s
- Depress AC/DC push-buttons
- Set Trigger Levels A and B to approximately 0.5 V



- Set the output signal from the pulse generator to an amplitude of 1 V, a repetition time of 0.1 ms and a duty factor of 0.3
- Perform the test below

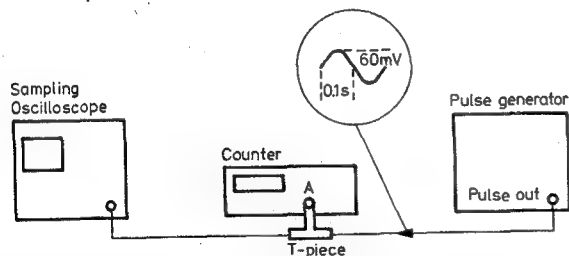
| Slope setting channel A | Slope setting channel B | Displayed value |
|-------------------------|-------------------------|-----------------|
| | | 00000.1000 ms |
| | | 00000.0300 ms |
| | | 00000.1000 ms |
| | | 00000.0700 ms |

Sine wave sensitivity and ac/dc coupling Input A

This test requires a sine wave generator with a frequency range of 10 Hz to 80 MHz, a high frequency oscilloscope and a T-piece.

- Do the preliminary setting of the controls
- Set the Function Selectors to Frequency A 1 Hz

Test set up for 80 MHz measurement



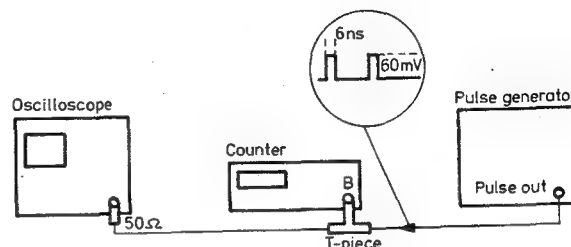
- Set the output signal from the sine wave generator to an amplitude of 60 mV_{p-p} and a frequency of 10 Hz
- Perform the test below

| Sine wave frequency | Coupling ac or dc | Displayed value |
|---------------------|-------------------|-----------------|
| 10 Hz | ac | 000000.000 kHz |
| 10 Hz | dc | 000000.010 kHz |
| 100 Hz | dc | 000000.100 kHz |
| 100 kHz | dc | 000100.000 kHz |
| 80 MHz | dc | 080000.000 kHz |

Pulse sensitivity Input B

This test requires a 3 MHz pulse generator, a low frequency oscilloscope and a T-piece.

- Do the preliminary setting of the controls
- Set Input B to dc coupling and the Function Selectors to Period B 10²



- Set the pulse generator:

Amplitude: 60 mV

Pulse width: 6 ns

Frequency: 100 Hz

Pulse mode: normal

Polarity: positive

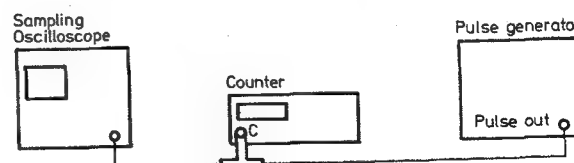
- Adjust Trigger Level control B until counter displays correct display read out according to the table below

| Pulse generator frequency | Function selector | Displayed value |
|---------------------------|--------------------------|-----------------|
| 100 Hz | Period B 10 ² | 001000000 ns |
| 100 kHz | Period B 10 ⁴ | 0010000.00 ns |
| 3 MHz | Period B 10 ⁶ | 00333.0000 ns |

Sine wave sensitivity Input C PM 6624

This test requires a sine wave generator with a frequency range of 50 MHz to 520 MHz, a high frequency oscilloscope and a T-piece.

- Do the preliminary setting of the controls
- Set the Function Selectors to Frequency C 10Hz



- Perform the test below

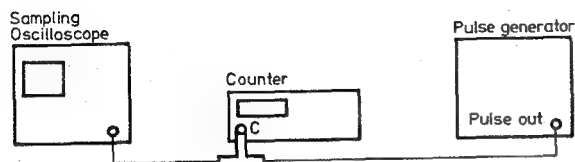
| Sine wave frequency | Sine wave amplitude | Displayed value |
|---------------------|----------------------|-----------------|
| 50 MHz | 30 mV _{p-p} | 0050.00000 MHz |
| 200 MHz | 30 mV _{p-p} | 0200.00000 MHz |
| 520 MHz | 30 mV _{p-p} | 0520.00000 MHz |

Performance Check

Sine wave sensitivity Input C PM 6625

This test requires a sine wave source with a frequency range of 50 MHz to 1 000 MHz, a high frequency oscilloscope and a T-piece.

- Do the preliminary setting of the controls
- Set the Function Selectors to Frequency C 10 Hz



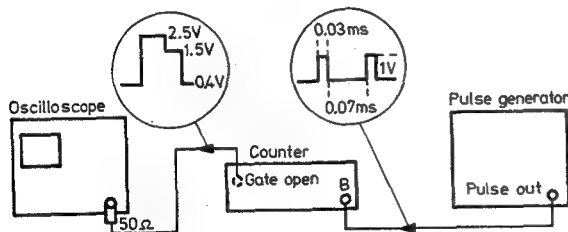
- Perform the test below

| Sine wave frequency | Sine wave amplitude | Displayed value |
|---------------------|----------------------|-----------------|
| 50 MHz | 30 mV _{p-p} | 0050.00000 MHz |
| 400 MHz | 30 mV _{p-p} | 0400.00000 MHz |
| 960 MHz | 30 mV _{p-p} | 0960.00000 MHz |
| 1 000 MHz | 40 mV _{p-p} | 1000.00000 MHz |

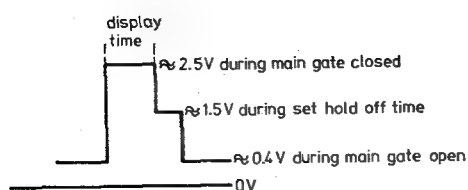
Gate open PM 6622

This test requires a low frequency oscilloscope, a pulse generator and a T-piece.

- Do the preliminary setting of the controls
- Set the Function Selectors to Time Interval A to B 0.1 ms, the Hold Off time to 100 ms and depress SEP/COM push-button
- Set the amplitude of the output signal from the pulse generator to 1 V, the repetition time to 0.1 ms and the duty factor to 0.3



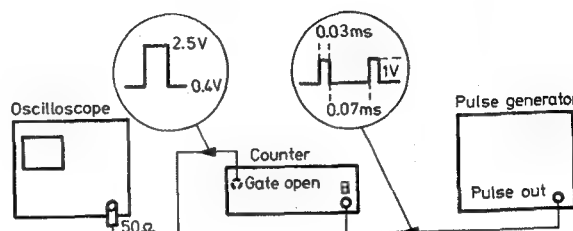
- Check that the oscilloscope displays the wave form below



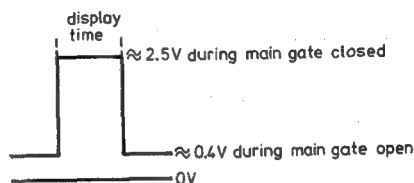
Gate open PM 6624 and PM 6625

This test requires a low frequency oscilloscope, a pulse generator and a BNC T-piece

- Do the preliminary setting of the controls
- Set Function Selectors to Time Interval A to B 0.1 ms and depress SEP/COM push-button
- Set the output signal from the pulse generator to an amplitude of 1 V, a repetition time of 0.1 ms and a duty factor of 0.3



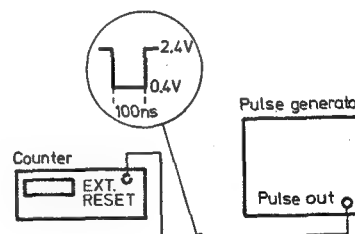
- Check that the oscilloscope displays the wave form below



External reset

This test requires a pulse generator with dc offset

- Do the preliminary setting of the controls
- Set the function selectors to Frequency A 10 Hz
- Set the Function Selectors to Frequency A 10 Hz
- Pull Display Time switch
- Depress Check push-button
- Set the pulse generator to single shot and inverted pulse mode
- Set the pulse to a width of 100 ns, an amplitude of 2 V and +0.4 V dc offset.



- Check that the Gate lamp is blinking and that digit N:o 1 (MSD) displays zero each time push-button Single Shot is depressed

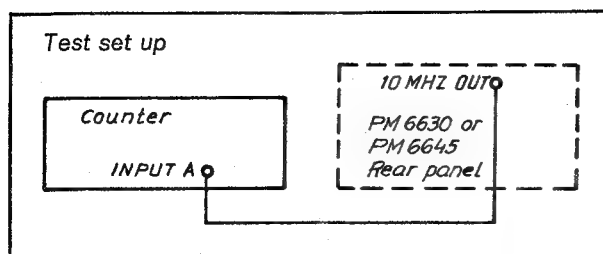
10 MHz Out

This test requires a low frequency oscilloscope and a 500 Ω probe.

- Do the preliminary setting of the controls
- Connect the oscilloscope to socket D and check that the oscilloscope displays a wave form with an amplitude of 1.8 V_{p-p} and a frequency of 10 MHz.

Oscillator PM 9677

Oscillator frequency check



— This check requires a frequency standard having an accuracy of 1×10^{-6} . The oven enclosed oscillators Philips PM 9680, PM 9681 and PM 9690 meet this requirement. The check should preferably be made at an ambient temperature of $+25^\circ \text{C}$.

— Set the controls of the counter:

FUNCTION SELECTOR: FREQUENCY A 1 Hz

TRIGGER LEVEL A: pulled

— Check that display shows 10000.000 kHz ± 10 Hz.

Oscillator frequency adjustment

This adjustment requires a reference oscillator having an accuracy of $\leq 1 \times 10^{-6}$.

The oven enclosed PHILIPS oscillators PM 9680*, PM 9681* and PM 9690* meet this requirement.

The adjustment should preferably be made at an ambient temperature of $+25^\circ \text{C}$.

— Remove the bottom cover of the counter.

— Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.

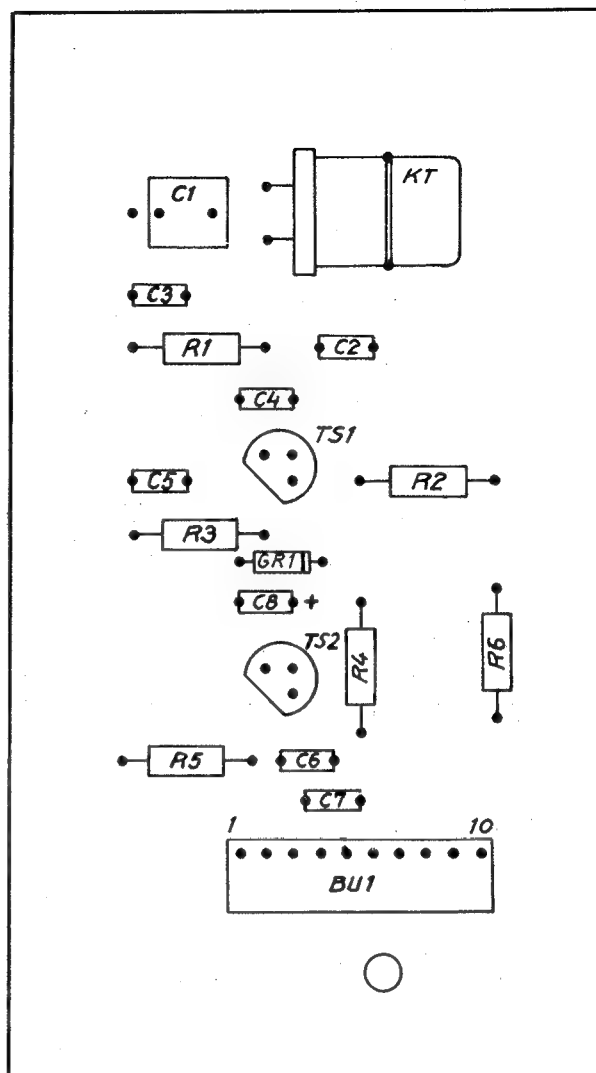
— Set the controls of the counter to be adjusted:

FUNCTION SELECTOR: FREQUENCY A 1 Hz

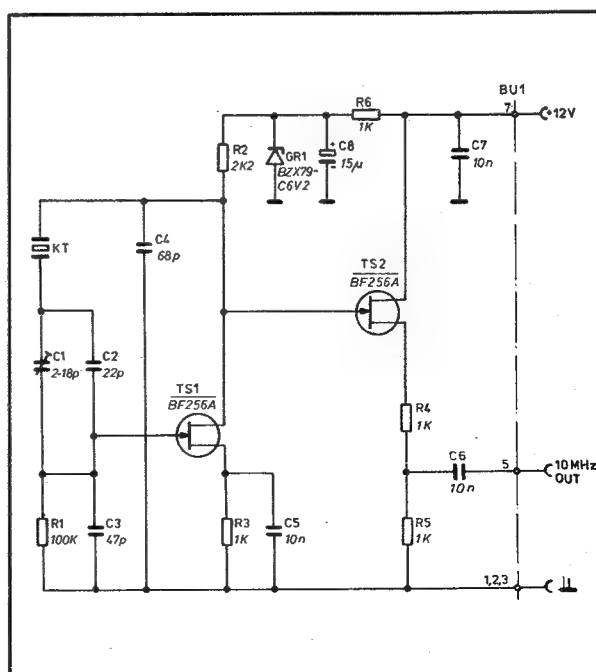
TRIGGER LEVEL A: pulled

— Adjust trimming capacitor C1 to 10000.000 kHz plus or minus 10 Hz.

Component layout



Circuit diagram



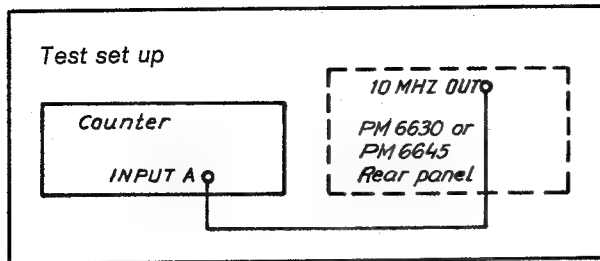
Spare parts

| Ordering no | Ω/F | % | V/W | Item |
|----------------|-------------------|---------|------|------|
| 4822 110 63161 | 100k | 5 | CR25 | R1 |
| 4822 110 63116 | 2,2k | 5 | CR25 | R2 |
| 4822 110 63107 | 1k | 5 | CR25 | R3 |
| 4822 110 63107 | 1k | 5 | CR25 | R4 |
| 4822 110 63107 | 1k | 5 | CR25 | R5 |
| 4822 110 63107 | 1k | 5 | CR25 | R6 |
| 5322 125 54029 | 2—18p | | 300 | C1 |
| 4822 122 31063 | 22p | 2 | 100 | C2 |
| 4822 122 31072 | 47p | 2 | 100 | C3 |
| 4822 122 31076 | 68p | 2 | 100 | C4 |
| 5322 122 34041 | 10n | —20 +50 | 100 | C5 |
| 5322 122 34041 | 10n | —20 +50 | 100 | C6 |
| 5322 122 34041 | 10n | —20 +50 | 100 | C7 |
| 5322 124 14036 | 15 μ | —10 +50 | 16 | C8 |

| Ordering no | Description | Item |
|----------------|---------------|------|
| 5322 130 44418 | BF 256 A | TS1 |
| 5322 130 44418 | BF 256 A | TS2 |
| 5322 130 30766 | BZX79—C6V2 | GR1 |
| 5322 242 74036 | Crystal 10MHz | |
| 5322 267 64031 | Connector | BU1 |

Oscillator PM 9678

Oscillator frequency check



— This check requires a frequency standard having an accuracy of 1×10^{-7} .
The oven enclosed oscillators Philips PM 9680, PM 9681 and PM 9690 meet this requirement.
The check should preferably be made at an ambient temperature of $+25^\circ \text{C}$.

— Set the controls of the counter:

FUNCTION SELECTOR: FREQUENCY A 0.1 Hz
TRIGGER LEVEL A: pulled

— Check that the display shows 10000.0000 kHz ± 1 Hz.

Oscillator frequency adjustment

— This adjustment requires a reference oscillator having an accuracy of $\leq 1 \times 10^{-7}$.
The oven enclosed PHILIPS oscillator PM 9680*, PM 9681* and PM 9690* meet this requirement.
The adjustment should preferably be made at an ambient temperature of $+25^\circ \text{C}$.

— Remove the bottom cover of the counter.

— Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.

— Set the controls of the counter to be adjusted:

FUNCTION SELECTOR: FREQUENCY A 1 Hz
TRIGGER LEVEL A: pulled

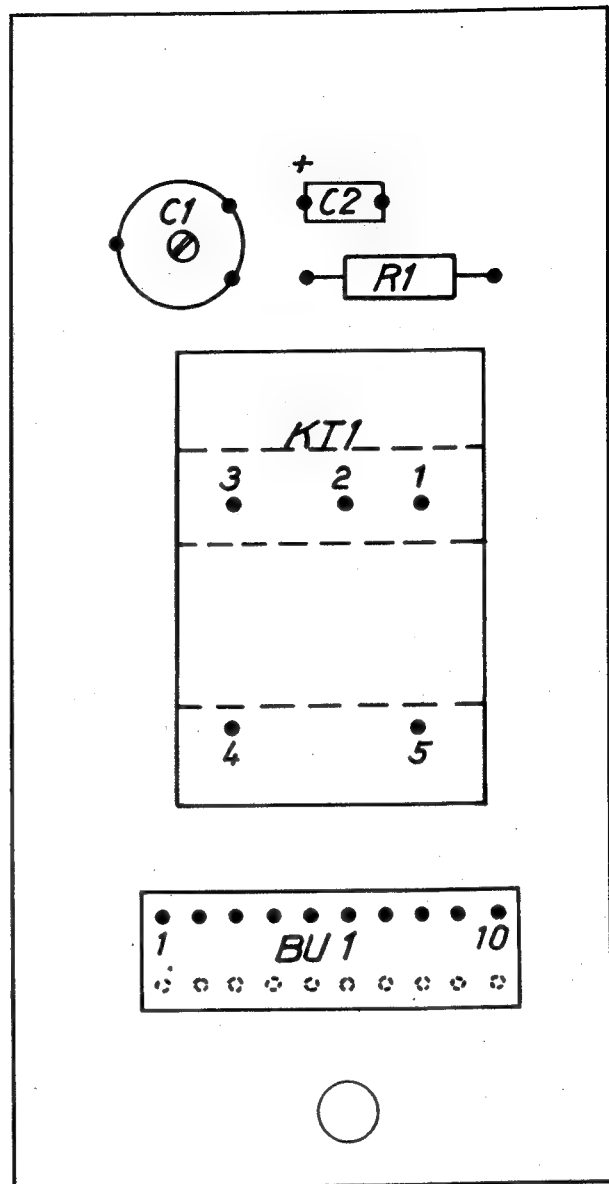
— Adjust trimming capacitor C1 to 10000.000 kHz plus or minus 1 Hz.

— Set FUNCTION SELECTION to position 0.1 Hz and check that display read out is the same as before. If not, adjust C1 slightly to correct frequency.

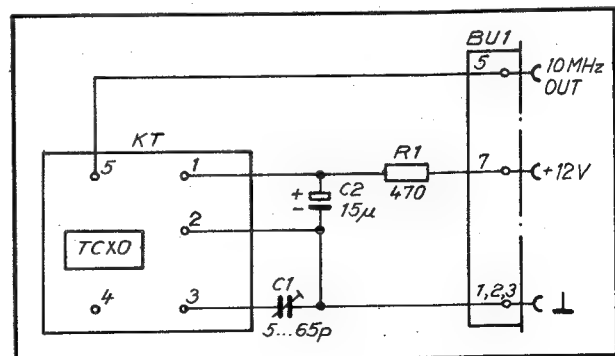
Spare parts

| Ordering number | Description | Item |
|-----------------|---------------------|------|
| 4822 110 63098 | 470 Ω 5 % | R1 |
| 5322 125 50057 | 5—65 P 100 V | C1 |
| 5322 124 14036 | 15 M —10 +50 % 16 V | C2 |
| 5322 267 64031 | Connector | BU1 |
| 5322 216 94047 | Crystal 10 MHz | |

Component layout

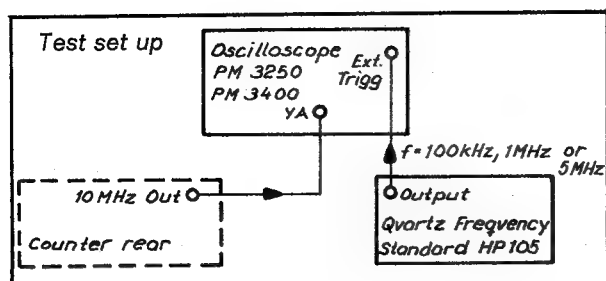


Circuit diagram



Oven Oscillators PM 9679B, PM 9690 and PM 9691

Oscillator frequency adjustment



This adjustment requires a frequency standard having an accuracy of 3×10^{-8} for PM 9679B, 10^{-9} for PM 9690 and better than 5×10^{-10} for PM 9691. Hewlett-Packard quartz frequency standard HP 105* meets this requirement.

The adjustment should preferably be made at an ambient temperature of 25°C and the oscillator must have been operating continuously 72 h before any adjustment is made.

- Remove the bottom cover of the counter
- Do the test set up
- Set the oscilloscope to 100 ns/div and adjust the oscillator's fine trimmer until the waveform on the oscilloscope moves with a velocity of maximum 1 div/10 s (0.1 Hz).

If the adjustment range is too narrow a coarse trimmer is available under the oscillator's text plate.

* To be adjusted against a frequency standard such as Draitwich or HBG.

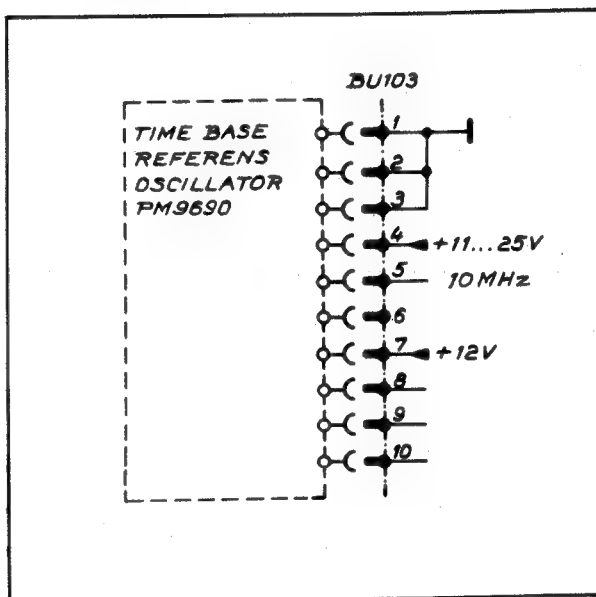
Repair of the oscillator

— Repair of this oscillator may not be carried out by the local service organisations. In case of breakdown the complete sealed oscillator box has to be sent to the factory for repair.

Factory address:

PHILIPS ELEKTRONIKINDUSTRIER AB
INDUSTRIAL OPERATIONS
FACK
S-175 20 JÄRFÄLLA
SWEDEN

Pin configuration



Power supply

General

The power supply operates from 115 V AC or 230 V AC 50 to 400 Hz or from the internal battery PM 9673 or from an external battery with an output voltage of 12 to 28 V. It provides five stabilised and overload-protected voltages of +120 V, +12 V, +5 V, -5 V and -50 V.

The power supply may be divided into the *power input circuit* mainly consisting of the mains transformer T 101 and rectifier GR 167, the *over-voltage protection circuit* mainly consisting of thyristor TS 150, TS 151 and zener diode GR 160, the *voltage regulation circuit* mainly consisting of voltage regulator IC 150, thyristor TS 154, the *DC-to-DC converter* mainly consisting of primary side of transformer T 102, driver TS 152 and switch TS 153.

Power input circuit

When the power supply operates from the *mains*, the 115 V AC or 230 V AC is transformed to 20 V AC by transformer T 101, rectified in the diode-bridge GR 167, filtered by C 152 and C 161 and fed to the power supply circuits via switch SK 121 and SK 102.

When the power supply operates from an *external battery* the current to the power supply circuits is fed from BU 21 at the rear panel via protecting diode GR 164 and switches SK 121 and SK 102.

When the internal battery is used the current is fed from pin 8 of BU 105 via SK 121 and SK 102 to the power supply circuits.

D.c. to d.c. converter

The DC to DC converter is basically a blocking oscillator consisting mainly of switch transistor TS 153 and terminals 4—9 of the transformer T 102. When switch SK 102 is set to position ON, the DC voltage from the *power input circuit* is fed to the transistor TS 155 which works as a constant current source of approximately 1 mA (I_1).

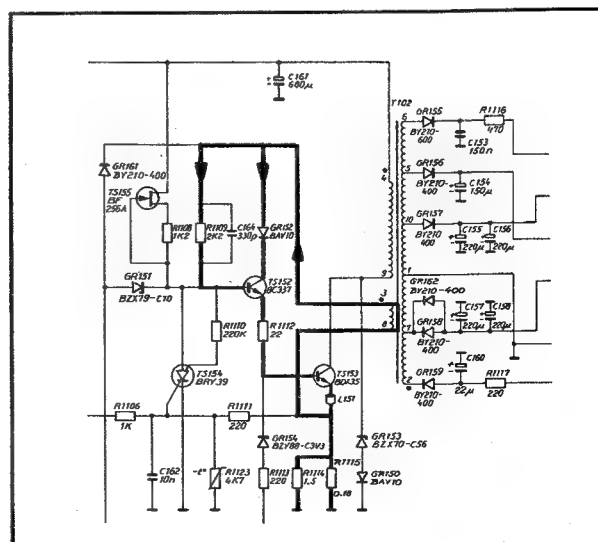
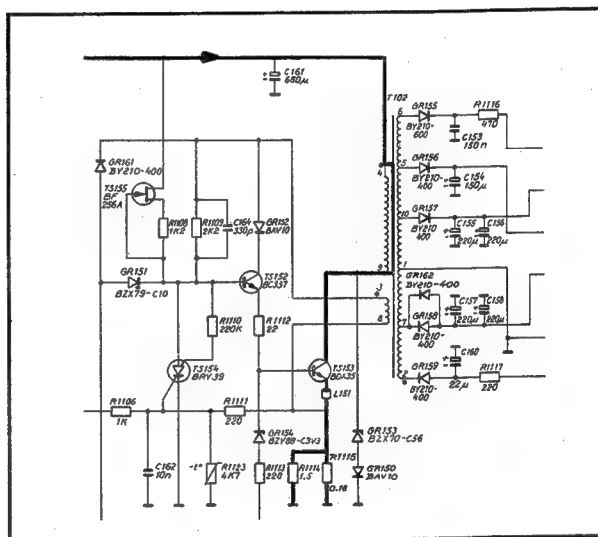
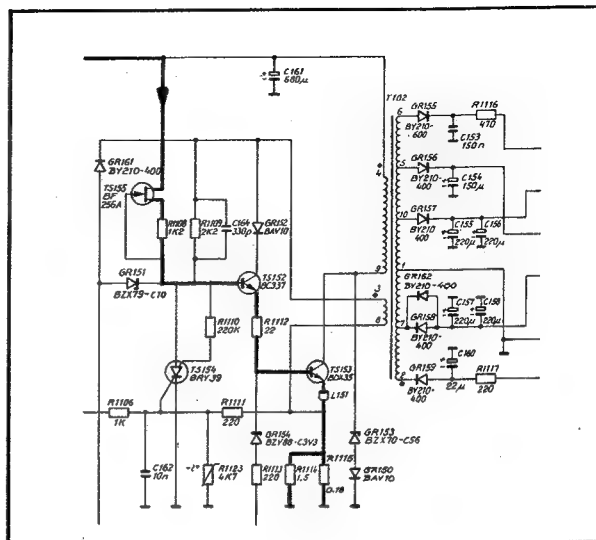
The current I_1 will cause switch transistor TS 153 to start conducting and the linearly increasing current I_2 to flow.

This current I_2 will cause a voltage across terminals 3—8 of the transformer and the current I_3 will start to flow.

This will cause drive transistor TS 152 to saturate switch transistor TS 153. When the transistor no longer can saturate, current I_3 will stop to increase and the induced voltage at terminal 3 of transformer T 102 will disappear.

This will cause TS 153 to switch off and the collector voltage to rise to the same level as the supply voltage. At this moment the magnetic flux will discharge through the secondary windings of T 102 and diodes GR 155—159.

Current paths in d.c. to d.c. converter



Power supply

Over voltage protection

The over-voltage protection circuit consists mainly of thyristors TS 150, TS 151 and zener diode GR 160.

The anode of GR 160 is connected to the +5 V output from the power supply. If this voltage increases to 5.6 V...5.8 V, the zener diode GR 160 will start to conduct and a current will flow through resistor R 1121. The voltage drop across R 1121 is fed to the gate of thyristor TS 151 via resistor R 1120. The anode is connected to the +5 V output voltage via resistor R 1118.

The thyristor will switch on and a voltage drop arises across resistor R 1122. This voltage is fed to the gate of thyristor TS 150, whose anode is connected to the d.c. input voltage. The thyristor will switch on and blow fuse VL 150, or, if the counter is operating in the internal battery mode, fuse VL 1 in the battery unit PM 9673. The capacitor across the gate and cathode of thyristor TS 151 prevents transients from the mains to blow fuse VL 150 accidentally.

Output voltage regulation circuit

The output voltage regulation circuit consists mainly of voltage regulator IC 150 and thyristor TS 154.

The purpose of the thyristor TS 154 is to switch off the drive transistor TS 152 in order to regulate the output voltage. The switching moment of thyristor TS 154 is determined by a voltage at the gate of the thyristor which is the sum of a DC regulation voltage from terminal 10 of IC 150 and a sawtooth voltage caused by the emitter current of TS 153 through resistor R 1114/R 1115.

The voltage regulator IC 150 is fed at terminal 12 with the supply voltage and at terminal 7 with a negative voltage, via GR 161, from winding 3—8 of transformer T 102.

IC 150 contains a differential amplifier with inputs at terminals 4 and 5.

The input at terminal 5 is grounded via R 1104 and the input at terminal 4 is connected to a voltage divider that consists of the reference output at terminal 6 and the negative voltage from winding 3—8 of transformer T 102 at terminal 7.

The differential amplifier is in balance when the voltage at terminal 7 is -5 V. When the supply voltage across windings 4—9 of transformer T 102 increases, the voltage at the differential amplifier at terminal 7 of IC 150 will go more negative, the DC regulation voltage at terminal 10 of IC 150 will go positive and turn on thyristor TS 154. This will connect the base of driver transistor to the ground and cause switch transistor TS 153 to switch off. The stored magnetic flux will then discharge in the secondary windings of T 102 and diodes GR 155—GR 159.

Replacing parts in the power supply

When replacing parts in the power supply, in particular IC 150, always check the +5,0 V supply.

Proceed as follows:

— Connect a voltmeter to BU 107 pin +5.2 V and check that the voltage is 4.8—5.2 V.

If the measured voltage does not reach 4.8—5.2 V unsolder R 1103 and select a resistor value that gives the desired voltage. The value of this resistor may be 1 k Ω to 33 k Ω . Typical value is 8 k Ω .

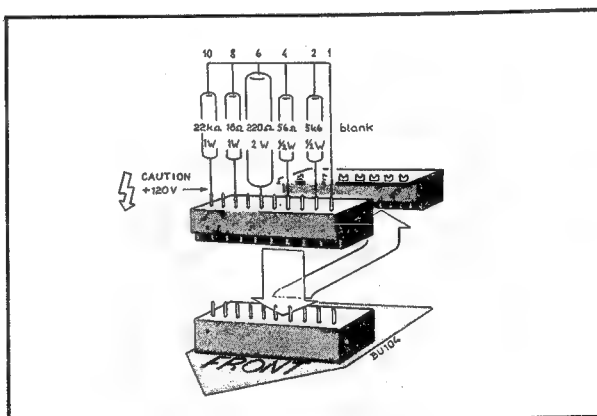
— Check the d.c. voltages.

D.C. voltages

— Connect the voltmeter to jumper connector BU 104 and check the d.c. voltages according to table below.

| Test point | Measured voltage |
|------------|------------------|
| +120 | 115 ... 130 V |
| +5.2 | 4.8 ... 5.2 V |
| +12 | 11.5 ... 13 V |
| -5.2 | -5 ... -5.4 V |
| -50 | -50 ... -60 V |

Dummy load



A fault in the power supply can be isolated easier if the counter circuits are disconnected by removing 10-pins connector BU 107. However, to simulate the load, a dummy load has to be fitted as shown in the figure. The dummy load can be assembled of the following components:

| | |
|---|----------------|
| 1 female connector 10 pins | 5322 267 54102 |
| 1 carbon resistor 22 Ω , 1 W | 4822 110 23143 |
| 1 carbon resistor 220 Ω , 1 W | 4822 110 23089 |
| 1 carbon resistor, 18 Ω , 2 W | 4822 110 10061 |
| 1 carbon resistor, 56 Ω , 0.5 W | 4822 110 53074 |
| 1 carbon resistor, 5.6 k Ω , 0.5 W | 4822 110 53127 |

CAUTION: + 120 V at pin 10 of the connector!

Power Supply

Troubleshooting the power supply

Crowbar circuit. The purpose of this circuit is to blow fuse VL 150 when the +5 V voltage becomes $\approx +6$ V. If the fuse blows when the counter is switched on or off check TS 150. A simple way to check the performance of this circuit is to connect a dc source set to 1 A and 15 V to the external battery sockets at the rear panel of the counter and remove printed board BU 107. If the current limit lamp then turns on, indicating that TS 150 is conducting, the crowbar circuit is working properly.

Voltage regulator. The purpose of this circuits is to regulate the d.c. output levels by turning on TS 154 and stop the oscillating.

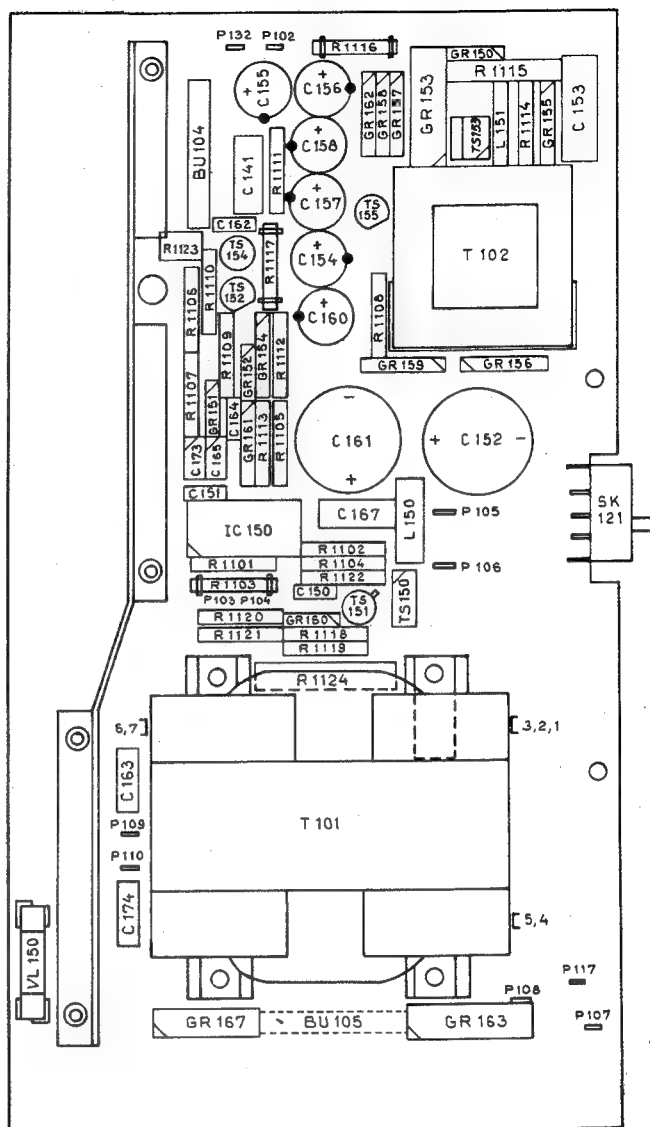
If the blocking oscillator does not oscillate check the voltage regulator by removing TS 154, if the blocking oscillator then starts to oscillate the fault may be caused by the voltage regulator.

D.c. to d.c. converter. This circuit is basically a blocking oscillator which is started by TS 155 and switched off by TS 154. If it is not oscillating check the voltage regulator and the base voltages at TS 152 (≈ 0.7 V) and TS 153 (≈ 1.4 V).

Switch off transistor TS 154. The purpose of this transistor is to switch off the blocking oscillator when the sum of the sawtooth voltage from the emitter of TS 153 and the dc voltage from terminal 10 of IC 150 becomes ≈ 0.5 V and turns on TS 154.

Current generator TS 155. The purpose of this transistor is to start the blocking oscillator by a bias current of ≈ 1 mA through base/emitter of TS 152 and TS 153. A voltage drop of ≈ 1 V across R1108 indicates that this circuit works properly.

Component layout power supply



Input amplifiers

General

The input amplifiers are identically, input B is, however, functionally limited to 10 MHz. In common mode the input circuits of amplifier A are disconnected and the signal is fed from input B via the separate/ common switch to amplifier A.

The signal is analogue from the input socket to amplifier IC 101 and when measuring these circuits the oscilloscope should be earthed via the earth-pin at C 102 or C 112. From IC 101 to C 103 the signal has ECL levels. The output from TS 103:C and TS 104:C is a TTL signal. When measuring the ECL and TTL signals the oscilloscope should be earthed via the earth-pin at IC 102:1.

Adjustment

D.C. balance amplifier A

— Disconnect all input signals, release all push-buttons and set the controls of the counter:

Start/Stop upper position
Trigg. level pot. pulled

— Connect the voltmeter between IC 101:6 and ground and adjust R1104 until voltmeter shows 0 V ± 2 mV.

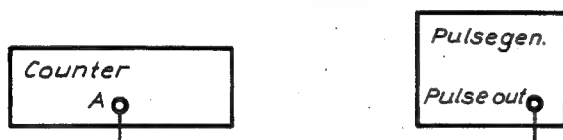
D.C. balance amplifier B

— Disconnect all input signals, release all push-buttons and set the controls of the counter:

Start/Stop upper position
Trigg. level pot. pulled.

— Connect the voltmeter between IC 101:12 and ground and adjust R1104 until voltmeter shows 0 V ± 2 mV.

Frequency compensation amplifier A



— Set the controls of the counter:

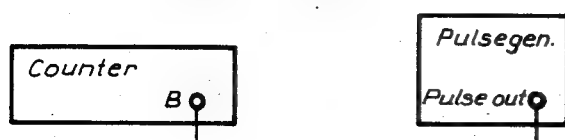
Attenuator 200 mV position

— Set the controls of the pulse generator:

Frequency 10 kHz
Amplitude 1 V
Duty factor 0.5

— Connect the oscilloscope via a well adjusted 10 M Ω /11 pF probe to terminal 6 of IC 101 and adjust C 102 to minimum distortion of the displayed waveform.

Frequency compensation amplifier B



— Set the controls of the counter:

Attenuator 200 mV position

— Set the controls of the pulse generator:

Frequency 10 kHz
Amplitude 1 V
Duty factor 0.5

— Connect the oscilloscope via a well adjusted 10 M Ω /11 pF probe to terminal 12 of IC 101 and adjust C 112 to minimum distortion of the displayed waveform.

Functional check

Preliminary setting of the controls

- All push-buttons in released position.
- Display time potentiometer in power on position and minimum display time.
- Trigger level potentiometers in pulled position.
- Hold off in position off.
- Internal/external slide switch in position internal.

Control circuits for prescaler and check modes

Truth table for channel A

| | Check mode | Prescaler mode |
|-----------|------------------|-----------------------------|
| SK 120 | | |
| pin 1 | Floating | Ground |
| pin 3 | Ground | |
| pin 4 | High TTL | Ground |
| pin 5 | Ground | |
| IC 101 | | |
| pin 1 | Floating | Ground |
| pin 2 | Low ECL | Don't care |
| pin 3 | Low ECL | Don't care |
| IC 152 | | |
| pin 1 | High TTL | Ground |
| pin 2 | 10 MHz | 10 MHz |
| pin 3 | 10 MHz | High TTL |
| SK 108 | | |
| pin 2 | High ECL | High ECL |
| pin 5 | 10 MHz ECL swing | High ECL |
| IC 103 | | |
| pin 5 | Low ECL | Prescaler signal, ECL swing |
| pin 6 | 10 MHz ECL swing | Low ECL |
| IC 155:13 | Low TTL | High TTL |

Amplifier and Schmitt-trigger IC 101

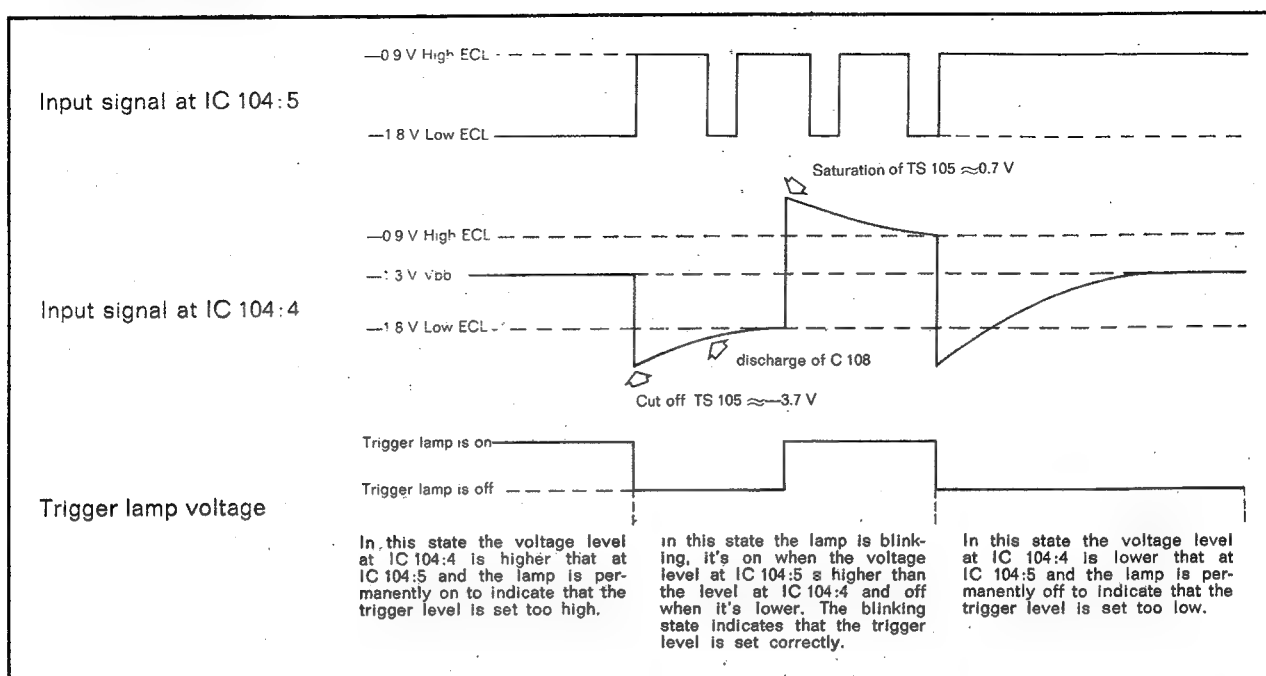
IC 101 is an amplifier and Schmitt trigger with analogue input and ECL output.

Pin configuration IC 101

| | | | |
|---------------------|---|----|---------------------|
| Enable | 1 | 16 | Ground |
| Out A | 2 | 15 | Out B |
| Out A | 3 | 14 | Out B |
| Clear A (-0.7 V) | 4 | 13 | Clear B (-0.7 V) |
| In $-$ A | 5 | 12 | In $+$ B |
| In $+$ A | 6 | 11 | In $-$ B |
| +5.0 V | 7 | 10 | +5.0 V |
| -5.2 V | 8 | 9 | Not connected |

Input amplifiers

Tri state trigger indicator



Truth table IC 101

| Ampl. A Pin 5 and 6 | Ampl. B Pin 11 and 12 | Ampl. A and B Pin 2 and 14 | Ampl. A and B Enable Pin 3 and 15 | Pin 1 |
|------------------------|--------------------------|-------------------------------|--------------------------------------|-------|
| 6 > 5 | | H | H | Gnd |
| 6 < 5 | | L | H | Gnd |
| | 12 > 11 | H | L | Gnd |
| | 12 < 11 | L | H | Gnd |
| Don't care | Don't care | -2.2 V | 2...2.2 V | |

H = -0.8 V L = -1.8 V

ECL/TTL converter

The input signal to IC 103 from the gate circuits has ECL levels. The A1 and A2 signals have TTL levels. The emitter signals of TS 103 and TS 104 have a voltage swing of approximately -0.8 V to -1.3 V.

Prescaler level detector

The prescaler level detector will feed the signal from the prescaler unit at IC 104:10 to the ECL/TTL converter when the voltage level at IC 104:9 is V_{bb} (-1.3 V). When the prescaler unit is not used the voltage level at IC 104:9 is low ECL.

Trigger level controls

- Do the preliminary setting of the counter.
- Depress trigger level controls and set them to fully CCW position.
- Check that the voltage at the monitor sockets are -2.7 ± 0.2 V and that the trigger indicator lamps are off.
- Set the trigger level controls to CW position.
- Check that the voltage at the monitor sockets are $+2.7 \pm 0.2$ V and that the trigger indicator lamps are on.

Slope controls

- Do the preliminary setting of the controls.
- Set the function selector to time interval A to B 0.1 ns and set the separate/common selector to common position.
- Connect a pulse generator to input B and set repetition time to 100 ms, duration to 30 ms and the amplitude to 1 V.
- Set the slope controls and check the display read-out according to table below.

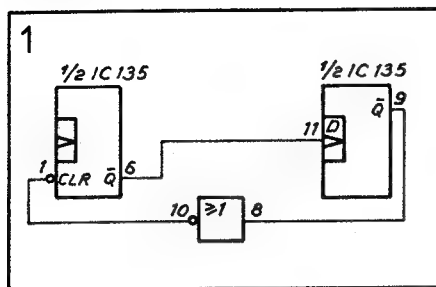
| Slope setting A and B | Display read-out | Unit |
|--------------------------|---------------------|------|
| pos. neg. | 0000030.0 | ms |
| pos. pos. | 00000100.0 | ms |
| neg. pos. | 0000070.0 | ms |
| neg. neg. | 00000100.0 | ms |

ac/dc coupling

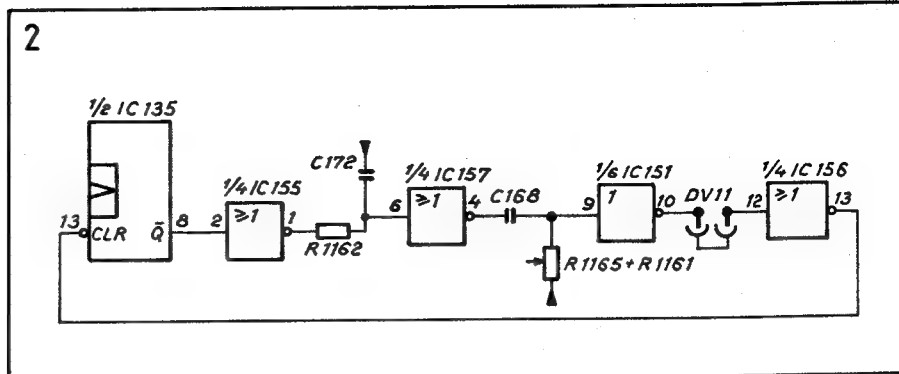
- Do the preliminary setting of the controls.
- Connect a square wave pulse with a frequency of 1 MHz, an amplitude of +2 V and a dc level of +2.5 V to the counter's A input.
- Set the function selector to Frequency A 1 Hz, the attenuator to 200 mV and the ac/dc selector to ac position.
- Check that display read out is 1000 kHz.
- Set ac/dc selector to dc position and check that display read out is zero.
- Set the function selectors to period ≈ 0.1 μ s, the attenuator to 200 mV and the ac/dc selector to ac position.
- Check that display read out is 0.0010 ms.
- Set ac/dc selector to dc position and reset the counter.
- Check that display read out is zero.

Main Gate and Display Time Circuits

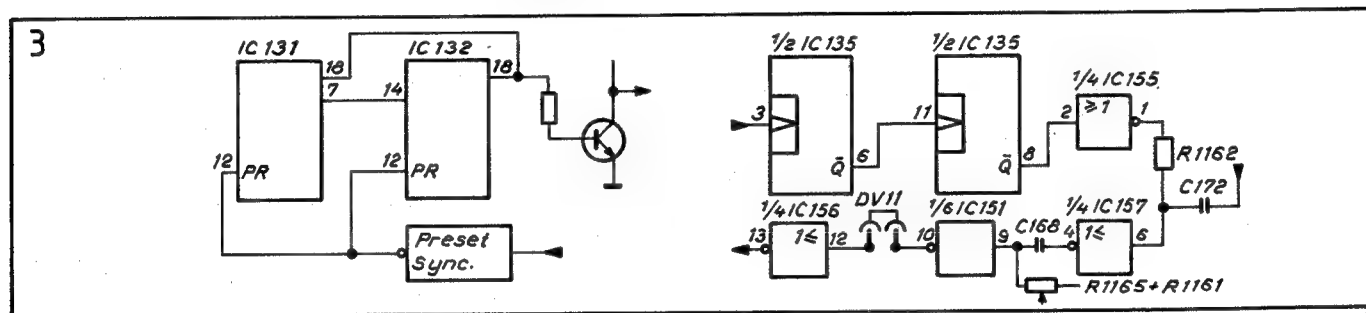
The three Reset Loops below are presented in the same order as they are closed during a Main Gate and Display time sequence.



This Reset Loop makes a Low Clear in the Main Gate flip flop in the beginning of the Display Time. See time t_2 in the timing diagram.



This Reset Loop makes a Low Clear in the Display flip flop when Reset arrives. See time t_3 in the timing diagram.



This Reset Loop makes a Low Preset in the Time Base Divider IC 131 and IC132.

Trouble shooting the Reset Loops

A fault in the Reset Loops can give fault symptoms in the Time Base, Main Gate and Display Time circuits. To isolate a fault in the Reset Loops use the following procedure.

— **Set the controls** of the counter.
Function Selectors: Single Period B
0.1 ms
Slope: positive
Attenuator: 20 mV
Coupling: dc
Trigger Level: ~ 0.5 V
Display Time: around mid position
Hold Off: off

— **Connect Sync Out** from a pulse generator set to Single Shot mode to Input B of the counter.

— **Reset the counter** and measure the logic levels as shown in the Reset truth table. See time t_1 in the timing diagram.

Push Single Shot once and measure the logic levels as shown in the First Single Shot truth table. See the time interval t_1 to t_2 in the timing diagram.

Reset

| Terminal Level | :1 | :2 | :3 | :4 | :5 | :6 | :8 | :9 | :10 | :11 | :12 | :13 |
|-------------------|----|----|----|----|----|----|----|----|-----|-----|-----|-----|
| IC 135 | H | H | | H | L | H | H | L | H | H | H | H |
| IC 151 | | | | | | | | H | L | | | |
| IC 154 | | | | H | L | H | | | | | | |
| IC 155 | L | H | L | L | H | L | | | | | | |
| IC 156 | L | H | H | H | L | L | L | L | H | L | L | H |
| IC 157 | | | | H | L | L | H | H | L | H | L | L |
| IC 158 | L | L | H | H | H | L | | | | L | H | H |

First Single Shot

| Terminal Level | :1 | :2 | :3 | :4 | :5 | :6 | :8 | :9 | :10 | :11 | :12 | :13 |
|-------------------|----|----|----|----|----|----|----|----|-----|-----|-----|-----|
| IC 135 | H | L | | H | H | L | H | L | H | L | H | H |
| IC 151 | | | | | | | | H | L | | | |
| IC 154 | | | | H | H | L | | | | | | |
| IC 155 | L | H | L | L | H | L | | | | | | |
| IC 156 | L | H | H | H | L | L | L | L | H | L | L | H |
| IC 157 | | | | H | L | L | L | L | H | L | L | H |
| IC 158 | L | L | H | H | H | L | | | | L | H | H |

Logic

Push Single Shot a second time and measure the logic levels as shown in the Second Single Shot truth table immediately after the single shot is given. See time interval t_2 to t_3 in the timing diagram. This, and the following truth table, might be somewhat difficult to measure because of the influence from the RC network R1156//C173, R1159//C172 and the display time R1157+R1158//C171.

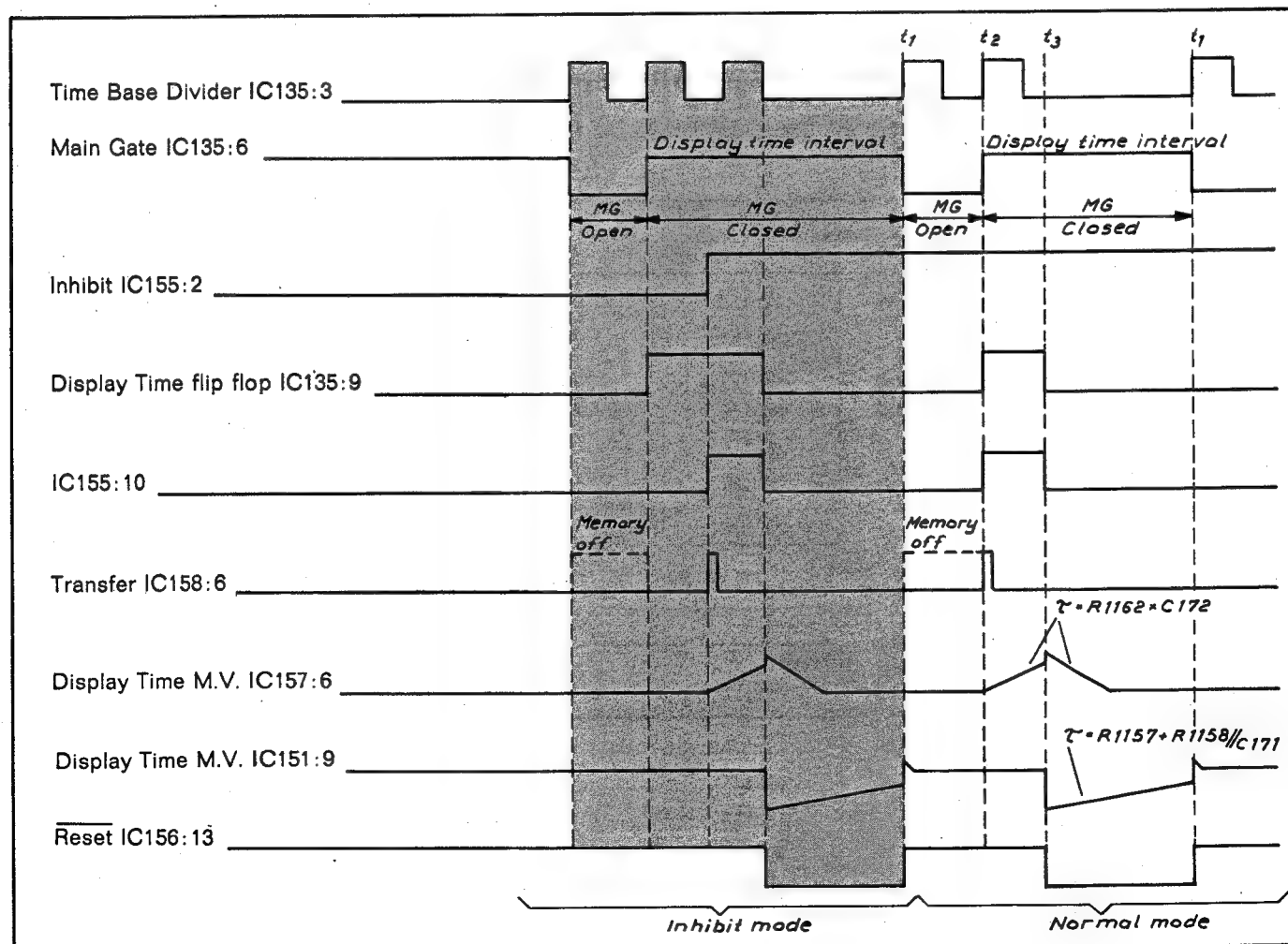
Second Single Shot

| Terminal \ Level | :1 | :2 | :3 | :4 | :5 | :6 | :8 | :9 | :10 | :11 | :12 | :13 |
|------------------|----|----|----|----------------|----------------|----------------|----|----|-----|-----|-----|-----|
| IC 135 | L | H | | H | L | H | L | H | H | H | L | H |
| IC 151 | | | | | | | | H | L | | | |
| IC 154 | | | | H | L | H | | | | | | |
| IC 155 | H | L | L | L | H | H | | | | | | |
| IC 156 | L | H | H | $\overline{1}$ | $\overline{1}$ | L | H | L | L | L | L | H |
| IC 157 | | | | H | H | L | H | H | L | H | L | L |
| IC 158 | L | L | H | $\overline{1}$ | H | $\overline{1}$ | | | | L | H | H |

The last truth table shows the logic levels in the time interval t_3 to t_1 in the timing diagram.

After the display time is out the logic levels will return to what is shown in the first truth table (Reset).

| Terminal \ Level | :1 | :2 | :3 | :4 | :5 | :6 | :8 | :9 | :10 | :11 | :12 | :13 |
|------------------|----|----|----|----|----|----|----|----|-----|-----|-----|-----|
| IC 135 | L | H | | H | L | H | H | L | H | H | H | L |
| IC 151 | | | | | | | | L | H | | | |
| IC 154 | | | | H | L | H | | | | | | |
| IC 155 | L | H | L | L | H | L | | | | | | |
| IC 156 | H | L | L | H | L | L | L | H | L | L | H | L |
| IC 157 | | | | L | H | H | H | H | L | H | L | L |
| IC 158 | L | L | H | H | H | L | | | | L | H | H |



Quad Decade IC 132...133 and IC 177...178

The Quad Decade contains four separate decades and a flip-flop, in this application the flip-flop is not used. The Preset Input is a common input for the decades, a High level applied to this input will preset all decades to 19999.

The Reset Input is also a common input and a High level applied to this input will reset all decades to zero.

The Count Input is an exclusive input for the first decade, the signal to be counted is applied to this input. Each decade has a Carry Output which is connected to the Carry Input of the following decade.

All carry signals except from the first decade are available for measurement, in this application only Carry 10 000 is used.

The carry signal is active Low and its pulse width is equal to the repetition time of the signal at the Count Input.

Each decade has also a BCD output and a Latch.

The latch is a memory where the BCD information from the decades are stored.

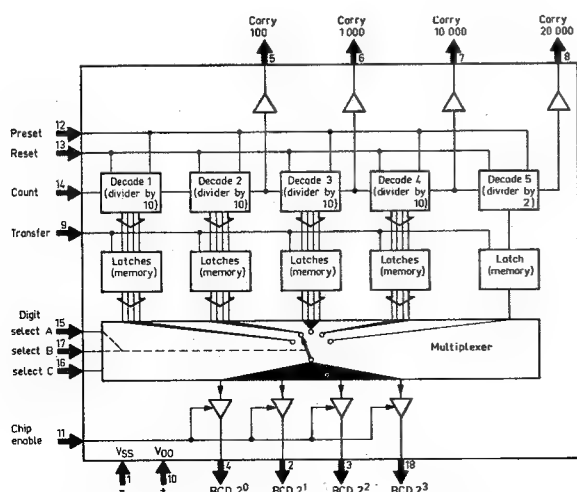
The Transfer Input is a common input for the decades, a High Level applied to this input will open all latches and feed the BCD information stored in the latches to the multiplexer.

The Multiplexer is a programmable selector, the signals applied at the digit select inputs determines which latch the multiplexer will select, in this application input C is not used.

The BCD output is a tri state output, it can be logic 1, logic 0 or high-ohmic.

A High Level at Chip Enable Input will allow the multiplexer pass the BCD information in the preselected latch to the BCD output, a Low level makes the output high-ohmic.

| Input A | Input B | Decade selection |
|---------|---------|------------------|
| L | L | Decade 1 |
| H | L | Decade 2 |
| L | H | Decade 3 |
| H | H | Decade 4 |



See also the Timing Diagram in the Main Gate and Display Time description.

First Decade

The First Decade is working up to 80 MHz and is designed with discrete integrated circuits. It contains a divider by 10 IC 174, a memory IC 175 and a gate output with open collector IC 176.

Decimal point setting

The Decimal Point Signals are fed from output 1 to 8 of the Address Decoder via the Decimal Point Switch to input 6 of the 7 Segment Decoder. A table in Logic Circuits diagram shows which settings of the Function Selector will interconnect which pins of the Decimal Point Switch and thereby connect one of the decimal point outputs from the Address Decoder to the decimal point input of the 7 Segment Decoder.

Gate Lamp Multivibrator

This circuit extends the fastest main gate signal and makes it suitable for driving the gate lamp. The input to this circuit is the main gate signal at IC 157:3 and the output is the signal to the gate lamp at BU 101:7.

Blanking Pulse Generator

This circuit turns off the display between the presentation of each digit to prevent streamers between adjacent digits.

The input to this circuit is the display clock signal at R1176 and the output is the blanking signal to the emitters of TS 180...188 and IC 181:1.

Positive going pulse from the display clock will turn off TS 177 and thereby the cathode and anode voltages to the display. Test points 6 and 7 show the display clock signal and the blanking signal.

Display

The display is a 9 digits gas discharge display, each digit has 7 segments and a decimal point.

Each one of the digits are connected to a driving transistor which is connected to an output of the Address Decoder.

A low input from the Address Decoder turns on the transistor and its digit, this is shown in oscillogram number 8 in the logic circuit diagram.

In one scanning cycle the outputs go from High to Low in the order 10:1:2:3:4:5:6:7:9, output number 10 is connected to the least significant digit and output number 9 is connected to the most significant digit. Only one digit will be presented at a time and before the next digit is presented a blanking pulse turns off the display. The blanking pulse is shown in oscillogram number 7 in the logic circuit diagram.

Display Clock and Address Counter

The Display Clock is an oscillator with a frequency of approximately 5 kHz. Test point 6 shows the output from the Display Clock to the Blanking Pulse Generator.

The Address Counter is a 1 of 10 to BCD converter and it is converting the Display Clock signal from IC 151:12 to Address Signals in BCD form.

Logic

Decades and 7 Segment Decoder

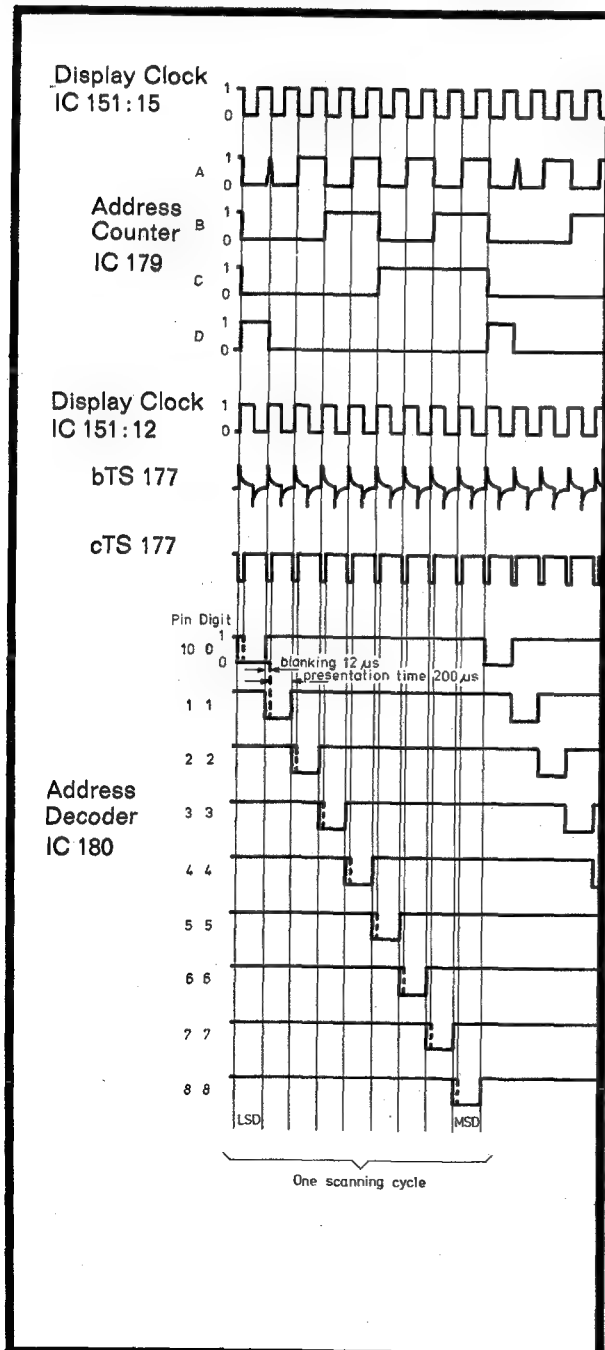
The address from the Address Counter selects which of the decades IC 176, IC 177 or IC 178 that will be presented on the display.

D bit from the Address Decoder selects the first decade, C and D bits select the first Quad Decade (2 to 5 decade) and the C bit selects the second Quad Decade (6 to 9 decade).

The A and B bits from the Address Decoder select which of the four decades in the quad decade that will be selected.

The outputs from the three decades are connected via a bus line to the 7 Segment Decoder.

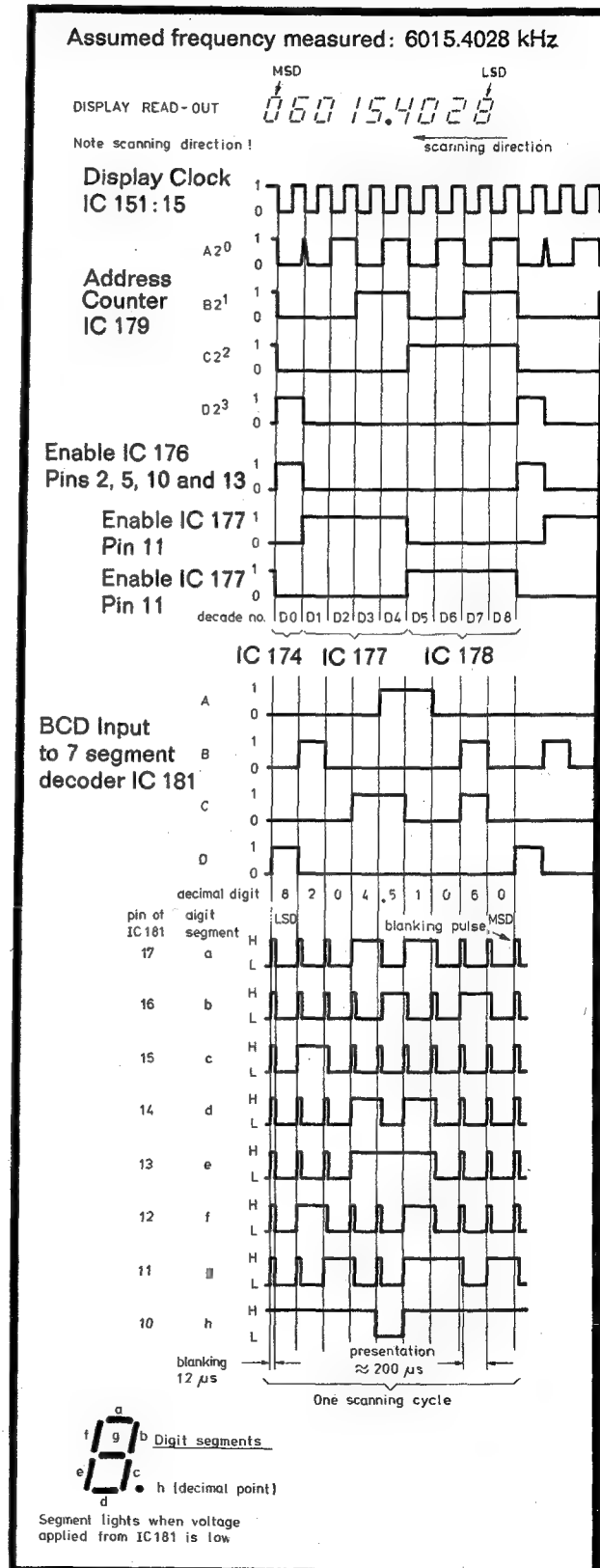
Display scanning and blanking pulse generation



Hold Off Circuits

The Hold Off Circuits extend the closing time of the Main Gate to prevent unwanted stop signals to end the measurement.

Display presentation



Basic board

| Ordering no | Ω | % | Type | Item |
|----------------|----------|-----|------|-------|
| 4822 110 63214 | 10M | 10 | CR25 | R1003 |
| 4822 110 63189 | 1.2M | 10 | CR25 | R1004 |
| 4822 110 63189 | 1.2M | 10 | CR25 | R1005 |
| 4822 110 63154 | 56 | 5 | CR25 | R1006 |
| 5322 116 54984 | 68 | 5 | PR37 | R1007 |
| 4822 110 63165 | 150K | 5 | CR25 | R1008 |
| 4822 110 63134 | 10K | 5 | CR25 | R1009 |
| 4822 110 63134 | 10K | 5 | CR25 | R1010 |
| 4822 110 63081 | 100 | 5 | CR25 | R1011 |
| 4822 110 60006 | 390 | 5 | CR25 | R1012 |
| 4822 110 63094 | 330 | 5 | CR25 | R1013 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R1017 |
| 4822 110 63092 | 270 | 5 | CR25 | R1018 |
| 4822 110 63087 | 180 | 5 | CR25 | R1019 |
| 4822 110 63107 | 1.0K | 5 | CR25 | R1020 |
| 4822 110 63098 | 470 | 5 | CR25 | R1021 |
| 4822 110 63098 | 470 | 5 | CR25 | R1022 |
| 4822 110 63134 | 10K | 5 | CR25 | R1023 |
| 4822 110 63109 | 1.2K | 5 | CR25 | R1024 |
| 4822 110 63089 | 220 | 5 | CR25 | R1025 |
| 4822 110 63132 | 8.2K | 5 | CR25 | R1026 |
| 4822 110 63098 | 470 | 5 | CR25 | R1028 |
| 4822 110 63098 | 470 | 5 | CR25 | R1029 |
| 4822 110 63121 | 3.3K | 5 | CR25 | R1030 |
| 4822 110 63214 | 10M | 10 | CR25 | R1033 |
| 4822 110 63189 | 1.2M | 10 | CR25 | R1034 |
| 4822 110 63189 | 1.2M | 10 | CR25 | R1035 |
| 4822 110 63154 | 56 | 5 | CR25 | R1036 |
| 5322 116 54984 | 68 | 5 | PR37 | R1037 |
| 4822 110 63165 | 150K | 5 | CR25 | R1038 |
| 4822 110 63134 | 10K | 5 | CR25 | R1039 |
| 4822 110 63134 | 10K | 5 | CR25 | R1040 |
| 4822 110 63081 | 100 | 5 | CR25 | R1041 |
| 4822 110 60006 | 390 | 5 | CR25 | R1042 |
| 4822 110 63094 | 330 | 5 | CR25 | R1043 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R1047 |
| 4822 110 63092 | 270 | 5 | CR25 | R1048 |
| 4822 110 63087 | 180 | 5 | CR25 | R1049 |
| 4822 110 63105 | 820 | 5 | CR25 | R1050 |
| 4822 110 63098 | 470 | 5 | CR25 | R1051 |
| 4822 110 63098 | 470 | 5 | CR25 | R1052 |
| 4822 110 63134 | 10K | 5 | CR25 | R1053 |
| 4822 110 63134 | 10K | 5 | CR25 | R1054 |
| 4822 110 63089 | 220 | 5 | CR25 | R1055 |
| 4822 110 63098 | 470 | 5 | CR25 | R1058 |
| 4822 110 63098 | 470 | 5 | CR25 | R1059 |
| 4822 110 63121 | 3.3K | 5 | CR25 | R1060 |
| 5322 116 50524 | 3.01K | 1 | MR25 | R1101 |
| 5322 116 54011 | 5.62K | 1 | MR25 | R1102 |
| SELECTED* | | | | |
| 4822 110 63107 | 1.0K | 5 | CR25 | R1103 |
| 4822 110 63121 | 3.3K | 5 | CR25 | R1104 |
| 4822 110 63107 | 1.0K | 5 | CR25 | R1105 |
| 4822 110 63107 | 1.0K | 5 | CR25 | R1106 |
| 4822 110 63107 | 1K | 5 | CR25 | R1107 |
| 4822 110 63109 | 1.2K | 5 | CR25 | R1108 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R1109 |
| 4822 110 63169 | 220K | 5 | CR25 | R1110 |
| 4822 110 63089 | 220 | 5 | CR25 | R1111 |
| 4822 110 63063 | 22 | 5 | CR25 | R1112 |
| 4822 110 63089 | 220 | 5 | CR25 | R1113 |
| 4822 110 63032 | 1.5 | 5 | CR25 | R1114 |
| 5322 116 54963 | 0.18 | 10 | | R1115 |
| 4822 110 63098 | 470 | 5 | CR25 | R1116 |
| 4822 110 63089 | 220 | 5 | CR25 | R1117 |
| 4822 110 63072 | 47 | 5 | CR25 | R1118 |
| 4822 110 63169 | 220 | 5 | CR25 | R1119 |
| 4822 110 63107 | 1.0K | 5 | CR25 | R1120 |
| 4822 110 63081 | 100 | 5 | CR25 | R1121 |
| 4822 110 63081 | 100 | 5 | CR25 | R1122 |
| 4822 116 30114 | 4.7K | NTC | NTC | R1123 |
| 4822 113 60084 | 1.0 | 10 | | R1124 |
| 4822 110 63134 | 10K | 5 | CR25 | R1127 |
| 4822 110 63107 | 1.0 | 5 | CR25 | R1128 |
| 4822 110 63107 | 1.0 | 5 | CR25 | R1129 |
| 4822 110 63107 | 1.0 | 5 | CR25 | R1130 |
| 4822 110 63163 | 120K | 5 | CR25 | R1131 |
| 4822 110 63152 | 47K | 5 | CR25 | R1132 |
| 4822 110 63089 | 220 | 5 | CR25 | R1133 |

| Ordering no | Ω | % | Type | Item |
|----------------|----------|----|------|-------|
| 4822 110 63098 | 470 | 5 | CR25 | R1134 |
| 4822 110 63098 | 470 | 5 | CR25 | R1135 |
| 4822 110 63098 | 470 | 5 | CR25 | R1136 |
| 4822 110 63098 | 470 | 5 | CR25 | R1137 |
| 4822 110 63152 | 47K | 5 | CR25 | R1138 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R1139 |
| 4822 110 63107 | 1.0 | 5 | CR25 | R1140 |
| 4822 110 63107 | 1.0 | 5 | CR25 | R1141 |
| 4822 110 63134 | 10K | 5 | CR25 | R1142 |
| 4822 110 63152 | 47K | 5 | CR25 | R1143 |
| 4822 110 63152 | 47K | 5 | CR25 | R1144 |
| 4822 110 63152 | 47K | 5 | CR25 | R1145 |
| 4822 110 63152 | 47K | 5 | CR25 | R1146 |
| 4822 110 63134 | 10K | 5 | CR25 | R1147 |
| 4822 110 63107 | 1.0 | 5 | CR25 | R1150 |
| 4822 110 63107 | 1.0 | 5 | CR25 | R1151 |
| 4822 110 60006 | 390 | 5 | CR25 | R1152 |
| 4822 110 63214 | 10M | 10 | CR25 | R1153 |
| 4822 110 63143 | 22K | 5 | CR25 | R1154 |
| 4822 110 63123 | 3.9K | 5 | CR25 | R1156 |
| 4822 110 63107 | 1.0 | 5 | CR25 | R1157 |
| 4822 110 63089 | 220 | 5 | CR25 | R1158 |
| 4822 110 63134 | 10K | 5 | CR25 | R1160 |
| 4822 110 63134 | 10K | 5 | CR25 | R1161 |
| 4822 110 63187 | 1M | 5 | CR25 | R1162 |
| 4822 110 63134 | 10K | 5 | CR25 | R1163 |
| 4822 110 63107 | 1.0 | 5 | CR25 | R1164 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R1166 |
| 4822 110 63114 | 1.8K | 5 | CR25 | R1167 |
| 4822 110 63114 | 1.8K | 5 | CR25 | R1168 |
| 4822 110 63185 | 820K | 5 | CR25 | R1170 |
| 4822 110 63098 | 470 | 5 | CR25 | R1171 |
| 4822 110 63098 | 470 | 5 | CR25 | R1172 |
| 4822 110 63114 | 1.8K | 5 | CR25 | R1173 |
| 4822 110 63114 | 1.8K | 5 | CR25 | R1174 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R1175 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R1176 |
| 4822 110 63143 | 22K | 5 | CR25 | R1177 |
| 4822 110 63129 | 6.8K | 5 | CR25 | R1178 |
| 4822 110 63138 | 15K | 5 | CR25 | R1180 |
| 4822 110 63138 | 15K | 5 | CR25 | R1181 |
| 4822 110 63138 | 15K | 5 | CR25 | R1182 |
| 4822 110 63138 | 15K | 5 | CR25 | R1183 |
| 4822 110 63138 | 15K | 5 | CR25 | R1184 |
| 4822 110 63138 | 15K | 5 | CR25 | R1185 |
| 4822 110 63138 | 15K | 5 | CR25 | R1186 |
| 4822 110 63138 | 15K | 5 | CR25 | R1187 |
| 4822 110 63138 | 15K | 5 | CR25 | R1188 |
| 4822 110 63098 | 470 | 5 | CR25 | R1189 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R1190 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R1191 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R1192 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R1193 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R1194 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R1195 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R1196 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R1197 |

| Ordering no | Ω | Description | Item |
|----------------|----------|-------------|-------|
| 5322 101 14011 | 100 | TRIMM POTM | R1014 |
| 5322 101 64017 | 47K | SK109 | R1015 |
| 5322 101 14011 | 100 | TRIMM POTM | R1044 |
| 5322 101 64017 | 47K | SK119 | R1045 |
| 5322 101 94007 | 1M | SK101 SK102 | R1165 |

| Ordering no | F | % | V | Item |
|----------------|------|--------|-----|------|
| 4822 121 40407 | 22N | 10 | 630 | C101 |
| 4822 122 31076 | 68P | 2 | 100 | C103 |
| 4822 122 31168 | 270P | 2 | 500 | C104 |
| 4822 122 31072 | 47P | 2 | 100 | C105 |
| 5322 122 34041 | 10N | -20+50 | 100 | C106 |
| 5322 121 40323 | 100N | 10 | 100 | C107 |
| 5322 124 14053 | 33M | -10+50 | 10 | C108 |
| 4822 121 40407 | 22N | 10 | 630 | C111 |
| 4822 122 31076 | 68P | 2 | 100 | C113 |

Basic board

| Ordering no | F | % | V | Item |
|----------------|------|--------|-----|------|
| 4822 122 31168 | 270P | 2 | 500 | C114 |
| 4822 122 31072 | 47P | 2 | 100 | C115 |
| 5322 122 34041 | 10N | -20+50 | 100 | C116 |
| 5322 121 40323 | 100N | 10 | 100 | C117 |
| 5322 124 14053 | 33M | -10+50 | 100 | C118 |
| 4822 122 31081 | 100P | 2 | 100 | C119 |
| 5322 124 14053 | 33M | -10+50 | 10 | C121 |
| 5322 122 34041 | 10N | -20+50 | 100 | C122 |
| 5322 124 14053 | 33M | -10+50 | 10 | C123 |
| 5322 122 34041 | 10N | -20+50 | 100 | C124 |
| 5322 122 34041 | 10N | -20+50 | 100 | C125 |
| 5322 122 34041 | 10N | -20+50 | 100 | C126 |
| 5322 122 34041 | 10N | -20+50 | 100 | C127 |
| 5322 122 34041 | 10N | -20+50 | 100 | C128 |
| 5322 122 34041 | 10N | -20+50 | 100 | C129 |
| 4822 121 40407 | 22N | 10 | 630 | C130 |
| 4822 122 31036 | 2.2P | 2 | 100 | C131 |
| 5322 122 34041 | 10N | -20+50 | 100 | C132 |
| 5322 124 14053 | 33M | -10+50 | 10 | C133 |
| 5322 124 14053 | 33M | -10+50 | 10 | C134 |
| 5322 122 34041 | 10N | -20+50 | 100 | C136 |
| 5322 122 34041 | 10N | -20+50 | 100 | C137 |
| 4822 124 10197 | 47M | -10+50 | 6.3 | C139 |
| 4822 124 10197 | 47M | -10+50 | 6.3 | C140 |
| 4822 121 40232 | 220N | 10 | 100 | C141 |
| 5322 122 34041 | 10N | -20+50 | 100 | C144 |
| 4822 122 30113 | 180P | 2 | 100 | C146 |
| 5322 122 34041 | 10N | -20+50 | 100 | C147 |
| 5322 122 34041 | 10N | -20+50 | 100 | C150 |
| 4822 122 31081 | 100P | | | C151 |
| 4822 124 20534 | 680M | -10+50 | 40 | C152 |
| 4822 121 40104 | 150N | 10 | 250 | C153 |
| 4822 124 20586 | 150M | -10+50 | 16 | C154 |
| 4822 124 20589 | 220M | -10+50 | 10 | C155 |
| 4822 124 20589 | 220M | -10+50 | 10 | C156 |
| 4822 124 20589 | 220M | -10+50 | 10 | C157 |
| 4822 124 20499 | 22M | -10+50 | 63 | C160 |
| 4822 124 20534 | 680M | -10+50 | 40 | C161 |
| 5322 122 34041 | 10N | -20+50 | 100 | C162 |
| 5322 124 24116 | 1M | | | C163 |
| 4822 122 31165 | 330P | 10 | 100 | C164 |
| 5322 124 14075 | 1M | -10+50 | 25 | C165 |
| 5322 122 34041 | 10N | -20+50 | 100 | C166 |
| 4822 121 40232 | 220N | 10 | 100 | C167 |
| 5322 124 14066 | 10M | -10+50 | 6.3 | C168 |
| 5322 122 34041 | 10N | -20+50 | 100 | C169 |
| 4822 122 31081 | 100P | 2 | 100 | C170 |
| 5322 121 40323 | 100N | 10 | 100 | C172 |
| 5322 121 40323 | 100N | 10 | 100 | C176 |
| 4822 122 30114 | 2.2N | 10 | 100 | C178 |
| 5322 122 34041 | 10N | -20+50 | 100 | C179 |
| 4822 121 41156 | 68N | 10 | 250 | C180 |
| 5322 121 44137 | 68N | 10 | 250 | C181 |
| 5322 121 44137 | 68N | 10 | 250 | C182 |
| 5322 121 44137 | 68N | 10 | 250 | C183 |
| 5322 121 44137 | 68N | 10 | 250 | C184 |
| 5322 121 44137 | 68N | 10 | 250 | C185 |
| 5322 121 44137 | 68N | 10 | 250 | C186 |
| 5322 121 44137 | 68N | 10 | 250 | C187 |
| 5322 121 44137 | 68N | 10 | 250 | C188 |
| 4822 121 40104 | 150N | 10 | 250 | C189 |

| Ordering no | F | V | Item |
|----------------|------|-----|------|
| 5322 125 54024 | 2-9P | 300 | C102 |
| 5322 125 54024 | 2-9P | 300 | C112 |

| Ordering no | Description | Item |
|----------------|----------------|-------|
| 5322 130 44578 | E411 SILICONIX | TS101 |
| 5322 130 44578 | E411 SILICONIX | TS102 |
| 5322 130 44435 | 2N5770 | TS103 |
| 5322 130 44435 | 2N5770 | TS104 |
| 5322 130 44215 | MPSLO8 | TS105 |
| 5322 130 44215 | MPSLO8 | TS106 |
| 5322 130 40407 | 2N2369 | TS142 |
| 4822 130 40855 | BC337 | TS146 |

| Ordering no | Description | Item |
|----------------|-------------------|-------|
| 5322 130 24035 | BT100A-02 | TS150 |
| 5322 130 40482 | BRV39 | TS151 |
| 4822 130 40855 | BC337 | TS152 |
| 5322 130 44417 | BOX35 | TS153 |
| 5322 130 40482 | BRV39 | TS154 |
| 5322 130 44418 | BF256A | TS155 |
| 4822 130 40937 | BC548B | TS156 |
| 5322 130 44256 | BC557 | TS177 |
| 5322 130 44247 | BSS68 | TS180 |
| 5322 130 44247 | BSS68 | TS181 |
| 5322 130 44247 | BSS68 | TS182 |
| 5322 130 44247 | BSS68 | TS183 |
| 5322 130 44247 | BSS68 | TS184 |
| 5322 130 44247 | BSS68 | TS185 |
| 5322 130 44247 | BSS68 | TS186 |
| 5322 130 44247 | BSS68 | TS187 |
| 5322 130 44247 | BSS68 | TS188 |
| 5322 209 85408 | MC1651L | 1C101 |
| 5322 209 84643 | MC10102P | 1C102 |
| 5322 209 85409 | GXB10110 | 1C103 |
| 5322 209 84825 | MC10216P | 1C104 |
| 5322 209 84183 | SN74S74N | 1C125 |
| 5322 209 84183 | SN74S74N | 1C126 |
| 5322 209 84304 | SN75107AN | 1C127 |
| 5322 209 85406 | N74LS54A | 1C128 |
| 5322 209 84628 | N7403A | 1C129 |
| 5322 209 84528 | SN7400N | 1C130 |
| 5322 209 84722 | GZF1201P MOS | 1C131 |
| 5322 209 84722 | GZF1201P MOS | 1C132 |
| 5322 209 85001 | SN74LS157N | 1C133 |
| 5322 209 84996 | SN74LS10N | 1C134 |
| 5322 209 84183 | SN74LS74N | 1C135 |
| 5322 209 84724 | SN74S64N | 1C136 |
| 5322 209 85407 | N74S02A | 1C137 |
| 5322 209 84655 | 723PC | 1C150 |
| 5322 209 85085 | F34049PC SELECTED | 1C151 |
| 5322 209 84983 | SN74LS00N | 1C152 |
| 5322 209 85412 | CD4093BE MOS | 1C153 |
| 5322 209 84983 | SN74LS00N | 1C154 |
| 5322 209 84993 | SN74LS02N | 1C155 |
| 5322 209 84993 | SN74LS02N | 1C156 |
| 5322 209 84976 | ICF4001PC | 1C157 |
| 5322 209 84983 | SN74LS00N | 1C158 |
| 5322 209 84984 | SN74LS04N | 1C159 |
| 5322 209 85411 | 74S196 | 1C174 |
| 5322 209 80059 | 74LS75 | 1C175 |
| 5322 209 84529 | SN7403N | 1C176 |
| 5322 209 84722 | GZF1201P MOS | 1C177 |
| 5322 209 84722 | GZF1201P MOS | 1C178 |
| 5322 209 80072 | SN7490AN | 1C179 |
| 5322 209 80142 | SN7442AN | 1C180 |
| 5322 209 84723 | DM8884AN | 1C181 |
| 5322 111 94015 | 6X1.0K | 1C190 |
| 5322 111 94015 | 6X1.0K | 1C191 |
| 5322 111 94031 | 6X47K | 1C192 |
| 5322 111 94031 | 6X47K | 1C193 |
| 5322 111 94012 | 6X6.8K | 1C194 |
| 5322 111 94012 | 6X6.8K | 1C195 |
| 5322 111 94031 | 6X47K | 1C196 |
| 5322 111 94012 | 6X6.8K | 1C197 |
| 5322 111 94026 | 6X470K | 1C198 |

| | | |
|----------------|------------|-------|
| 4822 130 30509 | BZY88-C4V3 | GR101 |
| 5322 130 30613 | BAW62 | GR102 |
| 5322 130 30613 | BAW62 | GR103 |
| 4822 130 30509 | BZY88-C4V3 | GR104 |
| 5322 130 34563 | BZX79-C2V7 | GR105 |
| 5322 130 30613 | BAW62 | GR106 |
| 5322 130 34563 | BZX79-C2V7 | GR107 |
| 5322 130 30613 | BAW62 | GR108 |
| 4822 130 30509 | BZY88-C4V3 | GR111 |
| 5322 130 30613 | BAW62 | GR112 |
| 5322 130 30613 | BAW62 | GR113 |
| 4822 130 30509 | BZY88-C4V3 | GR114 |
| 5322 130 34563 | BZX79-C2V7 | GR115 |
| 5322 130 30613 | BAW62 | GR116 |
| 5322 130 34563 | BZX79-C2V7 | GR117 |
| 5322 130 30613 | BAW62 | GR118 |

Basic board

| Ordering no | Description | Item |
|----------------|-------------|-------|
| 5322 130 30613 | BAW62 | GR121 |
| 5322 130 34047 | BZX75-C1V4 | GR122 |
| 5322 130 30613 | BAW62 | GR125 |
| 5322 130 30613 | BAW62 | GR138 |
| 5322 130 30613 | BAW62 | GR139 |
| 5322 130 30613 | BAW62 | GR140 |
| 5322 130 30613 | BAW62 | GR141 |
| 5322 130 30613 | BAW62 | GR142 |
| 5322 130 30613 | BAW62 | GR143 |
| 5322 130 30613 | BAW62 | GR144 |
| 5322 130 30613 | BAW62 | GR145 |
| 5322 130 30594 | BAV10 | GR150 |
| 5322 130 30774 | BZX79-C10 | GR151 |
| 5322 130 30594 | BAV10 | GR152 |
| 5322 130 34401 | BZX70-C56 | GR153 |
| 5322 130 30392 | BZY88-C3V3 | GR154 |
| 4822 130 30868 | BY207 | GR155 |
| 4822 130 30839 | BY206 | GR156 |
| 4822 130 30868 | BY210-400 | GR157 |
| 4822 130 30868 | BY210-400 | GR158 |
| 4822 130 30839 | BY206 | GR159 |
| 5322 130 34167 | BZX79-B6V2 | GR160 |
| 4822 130 30868 | BY210-400 | GR161 |
| 5322 130 30192 | BY126 | GR163 |
| 5322 130 30414 | BY164 | GR167 |
| 5322 130 30613 | BAW62 | GR170 |
| 5322 130 34049 | BZX75-C2V1 | GR171 |
| 5322 130 30613 | BAW62 | GR172 |
| 5322 130 30613 | BAW62 | GR173 |
| 5322 130 30613 | BAW62 | GR175 |
| 5322 130 34189 | BAW20 | GR180 |
| 5322 130 34189 | BAW20 | GR181 |
| 5322 130 34189 | BAW20 | GR182 |
| 5322 130 34189 | BAW20 | GR183 |
| 5322 130 34189 | BAW20 | GR184 |
| 5322 130 34189 | BAW20 | GR185 |
| 5322 130 34189 | BAW20 | GR186 |
| 5322 130 34189 | BAW20 | GR187 |
| 5322 130 34189 | BAW20 | GR188 |
| 5322 130 34166 | BZX79-C51 | GR189 |

| Ordering no | Description | Item |
|----------------|-------------------|--------|
| 4822 252 20001 | THERMAL FUSE | VL101 |
| 5322 131 94042 | DISPLAY | B101 |
| 5322 462 34127 | GUIDE RAIL | FOR U1 |
| 5322 158 10289 | INDUCTANCE 0.68MH | L101 |
| 5322 158 10289 | INDUCTANCE 0.68MH | L102 |
| 5322 158 10243 | INDUCTANCE 100MH | L103 |
| 5322 158 10284 | INDUCTANCE 47MH | L104 |
| 5322 158 10284 | INDUCTANCE 47MH | L105 |
| 5322 158 10052 | CHOKE | L150 |
| 4822 526 10097 | FXC BEAD | L151 |
| 5322 158 10052 | CHOKE | L152 |

| Ordering no | Description | Item |
|----------------|---------------------|---------|
| 5322 456 14054 | TEXT PLATE | PM6622 |
| 5322 456 14055 | TEXT PLATE | PM6624 |
| 5322 456 14056 | TEXT PLATE | PM6625 |
| 5322 450 64059 | WINDOW | |
| 5322 414 34076 | FUNCTION KNOB | SK105 |
| 5322 414 74019 | COVER FUNCTION KNOB | SK105 |
| 5322 414 34091 | DISPLAY KNOB | SK101 |
| 5322 414 74015 | COVER DISPLAY KNOB | SK101 |
| 5322 414 34091 | HOLD OFF KNOB | SK403 |
| 5322 414 74015 | COVER HOLD OFF KNOB | SK403 |
| 5322 414 34091 | TRIGGER KNOBS | |
| 5322 414 74015 | COVER TRIGGER KNOBS | |
| 5322 414 14011 | PUSH BUTTON KNOBS | |
| 5322 267 10004 | INPUT SOCKETS A B | BU1 BU2 |

| Ordering no | Description | Item |
|----------------|--------------------|------|
| 5322 267 34059 | EXT BATTERY SOCKET | BU21 |
| 5322 267 34059 | EXT BATTERY SOCKET | BU22 |
| 5322 265 30066 | MAINS INPUT SOCKET | BU23 |
| 5322 267 10004 | INPUT D-10MHZ OUT | BU24 |
| 5322 267 10004 | EXT. RESET | BU25 |
| 5322 267 10004 | GATE OPEN | BU27 |
| 5322 277 24017 | INT EXT STD SWITCH | SK22 |

| Ordering no | Description | Item |
|----------------|--------------------|---------|
| 5322 256 34031 | FUSEHOLDER | VL150 |
| 5322 255 44107 | IC HOLDER 16 PINS | D.I.L |
| 5322 255 44112 | IC HOLDER 18 PINS | D.I.L |
| 5322 255 40089 | TRANSISTOR HOLDER | TO 18-3 |
| 5322 255 40089 | TRANSISTOR HOLDER | TO 18-4 |
| 5322 265 54006 | TRANSISTOR HOLDER | TS153 |
| 5322 265 54006 | FEMALE CONNECTOR | BU 102 |
| 5322 265 54018 | MALE CONNECTOR | BU 102 |
| 5322 265 44064 | MALE CONNECTOR | BU103 |
| 5322 265 44064 | MALE CONNECTOR | BU104 |
| 5322 265 44064 | MALE CONNECTOR | BU105 |
| 5322 255 44107 | FEMALE CONNECTOR | BU106 |
| 5322 265 54006 | FEMALE CONNECTOR | BU107 |
| 5322 101 94007 | COMBINED SWITCH | SK101 |
| 5322 101 94007 | COMBINED SWITCH | SK102 |
| 5322 276 14117 | PUSH BUTTON SWITCH | SK103 |
| 5322 276 14117 | PUSH BUTTON SWITCH | SK104 |
| 5322 273 74008 | ROTARY SWITCH | SK105 |
| 5322 276 14117 | PUSH BUTTON SWITCH | SK106 |
| 5322 276 14117 | PUSH BUTTON SWITCH | SK107 |
| 5322 276 14117 | PUSH BUTTON SWITCH | SK108 |
| 5322 101 64017 | COMBINED SWITCH | SK109 |
| 5322 276 14117 | PUSH BUTTON SWITCH | SK110 |
| 5322 276 14117 | PUSH BUTTON SWITCH | SK116 |
| 5322 276 14117 | PUSH BUTTON SWITCH | SK117 |
| 5322 276 14117 | PUSH BUTTON SWITCH | SK118 |
| 5322 101 64017 | COMBINED SWITCH | SK119 |
| 5322 276 14117 | PUSH BUTTON SWITCH | SK120 |
| 5322 277 24006 | SLIDE SWITCH | SK121 |
| 5322 146 14079 | MAINS TRANSFORMER | T101 |
| 5322 142 64027 | DC-DC TRANSFORMER | T102 |
| 4822 253 20022 | FUSE 1.6A FAST | VL150 |

| Ordering no | Description | Qty |
|----------------|------------------|-----|
| 5322 498 54048 | HANDLE ARM | 2 |
| 5322 498 54054 | HANDLE PROFILE | 1 |
| 5322 520 34164 | BEARING BUSH | 2 |
| 5322 414 64053 | CAP HANDLE ARM | 2 |
| 5322 447 84467 | TOP COVER | 1 |
| 5322 447 84466 | BOTTOM COVER | 1 |
| 5322 466 85335 | FRONT ORNAMENT | 1 |
| 5322 459 24054 | REAR ORNAMENT | 1 |
| 5322 462 44181 | REAR FOOT | 4 |
| 5322 462 44179 | BOTTOM FOOT | 4 |
| 4822 462 70497 | PLUG BOTTOM FOOT | 4 |

| Ordering no | Description | Item |
|----------------|----------------|----------|
| 5322 321 24389 | CABLE COMPLETE | U3 TO U1 |
| 5322 268 24073 | TEST SOCKET | BU302 |
| 5322 268 24073 | TEST SOCKET | BU303 |
| 5322 130 34562 | LD35/II | GR301 |
| 5322 130 34562 | LD35/II | GR302 |
| 5322 130 34562 | LD35/II | GR303 |
| 5322 130 34562 | LD35/II | GR304 |
| 5322 130 34562 | LD35/II | GR305 |
| 5322 130 34562 | LD35/II | GR306 |
| 5322 130 34562 | LD35/II | GR307 |

| Ordering no | Description | Item |
|----------------|---------------------|-----------------|
| 5322 321 24391 | CABLE COMPLETE | U4 TO U1 |
| 5322 277 24006 | SLIDE SWITCH | SK401 |
| 5322 277 24006 | SLIDE SWITCH | SK402 |
| 5322 101 54008 | COMBINED | SK403-SK404R401 |
| 5322 121 54118 | CAPACITOR 150NF 63V | C401 |

Prescaler PM 6624

| Ordering no | Ω | % | Type | Item |
|----------------|----------|---|------|------|
| 4822 116 51142 | 150 | 5 | PR37 | R201 |
| 5322 116 54396 | 68 | 5 | PR52 | R202 |
| 5322 116 54396 | 68 | 5 | PR52 | R203 |
| 5322 116 50417 | 162 | 5 | MR25 | R204 |
| 4822 111 30328 | 330 | 5 | CR16 | R205 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R206 |
| 4822 110 63147 | 33K | 5 | CR25 | R207 |
| 4822 110 63107 | 1K | 5 | CR25 | R208 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R209 |
| 4822 110 63152 | 47K | 5 | CR25 | R210 |
| 4822 110 63107 | 1K | 5 | CR25 | R211 |
| 4822 110 63138 | 15K | 5 | CR25 | R212 |
| 4822 111 30067 | 33 | 5 | CR16 | R213 |
| 4822 110 63134 | 10K | 5 | CR25 | R214 |
| 4822 110 63141 | 18K | 5 | CR25 | R215 |
| 4822 110 63101 | 560 | 5 | CR25 | R216 |
| 4822 111 30264 | 2.7K | 5 | CR16 | R217 |
| 4822 111 30323 | 270 | 5 | CR16 | R218 |
| 4822 111 30272 | 680 | 5 | CR16 | R219 |
| 4822 111 30245 | 47 | 5 | CR16 | R220 |
| 4822 111 30347 | 10 | 5 | CR16 | R221 |
| 4822 110 63161 | 100K | 5 | CR25 | R222 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R223 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R224 |
| 4822 110 63134 | 10K | 5 | CR25 | R225 |
| 4822 110 63098 | 470 | 5 | CR25 | R226 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R227 |
| 4822 110 63054 | 10 | 5 | CR25 | R228 |
| 4822 111 30272 | 680 | 5 | CR25 | R229 |
| 4822 110 63098 | 470 | 5 | CR25 | R230 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R231 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R238 |

| Ordering no | Description | Item |
|----------------|-------------------|----------|
| 5322 158 14119 | COIL | L201 |
| 5322 158 14119 | COIL | L202 |
| 5322 158 10276 | INDUCTANCE 4.7MH | L203 |
| 5322 158 14119 | COIL | L204 |
| 4822 526 10025 | FXC BEAD | L205 |
| 4822 526 10025 | FXC BEAD | L207 |
| 4822 526 10025 | FXC BEAD | L208 |
| 4822 526 10025 | FXC BEAD | L209 |
| 4822 526 10025 | FXC BEAD | L210 |
| 5322 526 14019 | BEAD | L211 |
| 5322 265 54006 | FEMALE CONNECTOR | BU201 1 |
| 5322 265 54018 | MALE CONNECTOR | BU201 1 |
| 5322 535 94711 | DISTANCE PIECE | FOR U2 2 |
| 5322 462 34054 | GUIDE RAIL | FOR U2 2 |
| 5322 255 44122 | IC HOLDER 14 PINS | DIL 1 |
| 5322 255 40089 | TRANSISTOR HOLDER | TO18-3 2 |

| Ordering no | F | % | V | Item |
|----------------|------|--------|-----|------|
| 4822 122 31177 | 470P | 10 | 100 | C201 |
| 4822 122 31177 | 470P | 10 | 100 | C202 |
| 4822 122 31177 | 470P | 10 | 100 | C203 |
| 4822 122 31177 | 470P | 10 | 10 | C204 |
| 4822 122 30043 | 10N | -20+80 | 63 | C205 |
| 5322 122 34043 | 47P | 2 | 50 | C206 |
| 4822 122 31175 | 1N | 10 | 100 | C207 |
| 5322 124 14079 | 68M | | 6.3 | C208 |
| 4822 122 31043 | 3.9P | 2 | 63 | C209 |
| 4822 122 31173 | 220P | 10 | 100 | C211 |
| 4822 122 30094 | 220P | 10 | 100 | C212 |
| 4822 122 31177 | 470P | 10 | 100 | C213 |
| 4822 122 30043 | 10N | -20+80 | 63 | C214 |
| 5322 124 14036 | 15M | | 16 | C215 |
| 4822 122 31175 | 1N | 10 | 100 | C216 |
| 5322 122 34043 | 47P | 2 | 100 | C217 |
| 4822 122 31072 | 47P | 10 | 100 | C218 |
| 4822 122 30043 | 10N | -20+80 | 63 | C219 |
| 4822 122 31175 | 1N | 10 | 100 | C220 |
| 5322 122 34043 | 47P | 2 | 50 | C221 |
| 4822 122 31175 | 1N | 10 | 100 | C222 |
| 4822 122 31175 | 1N | 10 | 100 | C223 |
| 5322 124 14079 | 68M | | 6.3 | C224 |
| 4822 122 30043 | 10N | -20+80 | 63 | C225 |
| 4822 122 31072 | 47P | 10 | 100 | C226 |
| 4822 122 31173 | 220P | 10 | 100 | C227 |

| Ordering no | Description | Item |
|----------------|-------------|-------|
| 5322 130 34283 | HP5082-2835 | GR203 |
| 5322 130 34283 | HP5082-2835 | GR204 |
| 5322 130 34364 | BA379 | GR205 |
| 5322 130 34364 | BA379 | GR206 |
| 5322 130 34364 | BA379 | GR207 |
| 5322 130 30613 | BAW62 | GR208 |
| 5322 130 34283 | HP5082-2835 | GR209 |
| 5322 130 34283 | HP5082-2835 | GR210 |
| 5322 130 30666 | BZX79-C7V5 | GR211 |
| 5322 209 85414 | QM334 | IC201 |
| 5322 209 85414 | QM334 | IC202 |
| 5322 209 84721 | SP6708 | IC203 |
| 5322 209 84163 | SN72741P | IC204 |
| 5322 209 84163 | SN72741P | IC205 |
| 5322 209 84165 | SN7474N | IC206 |
| 5322 209 84165 | SN7474N | IC207 |
| 4822 130 40937 | BC548B | TS201 |
| 5322 130 40348 | BC178B | TS202 |
| 5322 130 44179 | BFR90 | TS203 |
| 4822 130 40937 | BC548B | TS204 |
| 5322 130 40343 | BC108B | TS205 |
| 5322 130 34364 | BA379 | GR201 |
| 5322 130 34364 | BA379 | GR202 |

| Ordering no | Ω | % | Type | Item |
|----------------|----------|---|------|------|
| 5322 116 54393 | 150 | 5 | PR52 | R201 |
| 5322 116 54396 | 68 | 5 | PR52 | R202 |
| 5322 116 54396 | 68 | 5 | PR52 | R203 |
| 5322 116 50417 | 162 | 5 | MR25 | R204 |
| 4822 111 30328 | 330 | 5 | CR16 | R205 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R206 |
| 4822 110 63147 | 33K | 5 | CR25 | R207 |
| 4822 110 63107 | 1K | 5 | CR25 | R208 |
| 4822 110 63125 | 4.7K | 5 | CR25 | R209 |
| 4822 110 63152 | 47K | 5 | CR25 | R210 |
| 4822 110 63107 | 1K | 5 | CR25 | R211 |
| 4822 110 63138 | 15K | 5 | CR25 | R212 |
| 4822 111 30348 | 27 | 5 | CR16 | R213 |
| 4822 110 63134 | 10K | 5 | CR25 | R214 |
| 4822 110 63141 | 18K | 5 | CR25 | R215 |
| 4822 110 63094 | 330 | 5 | CR25 | R216 |
| 4822 111 30265 | 2.2K | 5 | CR16 | R217 |
| 4822 111 30331 | 470 | 5 | CR16 | R218 |
| 4822 111 30312 | 4.7K | 5 | CR16 | R219 |
| 4822 111 30327 | 220 | 5 | CR16 | R220 |
| 4822 111 30347 | 10 | 5 | CR16 | R221 |
| 4822 110 63161 | 100K | 5 | CR25 | R222 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R223 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R224 |
| 4822 110 63134 | 10K | 5 | CR25 | R225 |
| 4822 110 63098 | 470 | 5 | CR25 | R226 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R227 |
| 4822 110 63054 | 10 | 5 | CR25 | R228 |
| 4822 111 30272 | 680 | 5 | CR16 | R229 |
| 4822 110 63098 | 470 | 5 | CR25 | R230 |
| 4822 110 63116 | 2.2K | 5 | CR25 | R231 |
| 4822 111 30324 | 100 | 5 | CR16 | R233 |
| 4822 111 30328 | 330 | 5 | CR16 | R234 |
| 4822 111 30328 | 330 | 5 | CR16 | R235 |
| 4822 110 63098 | 470 | 5 | CR16 | R236 |
| 4822 110 63069 | 39 | 5 | CR16 | R237 |
| 4822 110 63125 | 4.7K | 5 | CR16 | R238 |

| Ordering no | Description | Item |
|----------------|-----------------------|----------|
| 5322 158 14119 | COIL | L201 |
| 5322 158 14119 | COIL | L202 |
| 5322 158 10276 | INDUCTANCE 4.7MH | L203 |
| 5322 158 14119 | COIL | L204 |
| 5322 158 14119 | COIL | L205 |
| 5322 158 14119 | COIL | L206 |
| 5322 158 14119 | COIL | L207 |
| 5322 158 14119 | COIL | L208 |
| 5322 157 44024 | COIL | L209 |
| 4822 526 10025 | FXC BEAD | L210 |
| 4822 526 10025 | FXC BEAD | L211 |
| 4822 526 10025 | FXC BEAD | L212 |
| 4822 526 10025 | FXC BEAD | L214 |
| 5322 265 54006 | FEMALE CONNECTOR | BU201 1 |
| 5322 265 54018 | MALE CONNECTOR | BU201 1 |
| 5322 535 94711 | DISTANCE PIECE | FOR U2 2 |
| 5322 255 44122 | IC HOLDER 14 PINS DIL | 1 |
| 5322 255 40089 | TRANSISTOR HOLDER | TO18-3 2 |
| 5322 462 34054 | GUIDE RAIL | 2 |

| Ordering no | F | % | V | Item |
|----------------|------|--------|-----|------|
| 5322 122 34071 | 470P | 20 | 50 | C201 |
| 5322 122 34071 | 470P | 20 | 50 | C202 |
| 5322 122 34071 | 470P | 20 | 50 | C203 |
| 5322 122 34071 | 470P | 20 | 50 | C204 |
| 4822 122 30043 | 10N | -20+80 | 63 | C205 |
| 5322 122 34043 | 47P | 10 | 50 | C206 |
| 4822 122 31175 | 1N | 10 | 100 | C207 |
| 5322 124 14079 | 68M | -10+50 | 6.3 | C208 |
| 5322 122 34043 | 47P | 10 | 50 | C209 |
| 4822 122 31173 | 220P | 10 | 100 | C210 |
| 4822 122 31173 | 220P | 10 | 100 | C211 |
| 4822 122 31173 | 220P | 10 | 100 | C212 |
| 5322 122 34071 | 470P | 10 | 50 | C213 |
| 4822 122 30043 | 10N | -20+80 | 63 | C214 |
| 5322 124 14036 | 15M | -10+50 | 16 | C215 |
| 4822 122 31175 | 1N | 10 | 100 | C216 |
| 5322 122 34071 | 470P | 20 | 50 | C217 |
| 5322 122 34042 | 12P | 10 | 50 | C218 |
| 4822 122 30043 | 10N | -20+80 | 63 | C219 |
| 4822 122 31175 | 1N | 10 | 100 | C220 |
| 4822 122 30043 | 10N | -20+80 | 63 | C221 |
| 5322 122 34043 | 47P | 10 | 50 | C222 |
| 5322 122 34071 | 470P | 20 | 50 | C223 |
| 5322 124 14079 | 68M | -10+50 | 6.3 | C224 |
| 5322 122 34071 | 470P | 10 | 50 | C225 |
| 4822 122 31072 | 47P | 2 | 100 | C226 |
| 5322 122 34071 | 470P | 20 | 50 | C227 |
| 4822 122 31072 | 47P | 2 | 100 | C228 |
| 4822 122 30043 | 10N | -20+80 | 63 | C229 |
| 5322 122 34043 | 47P | 10 | 50 | C230 |
| 4822 122 31054 | 10P | 2 | 100 | C231 |

| Ordering no | Description | Item |
|----------------|-------------|-------|
| 5322 209 85414 | OM334 | 1C201 |
| 5322 209 85414 | OM334 | 1C202 |
| 5322 209 84725 | SP8616B | 1C203 |
| 5322 209 84165 | SN72741P | 1C204 |
| 5322 209 84165 | SN72741P | 1C205 |
| 5322 209 84165 | SN7474N | 1C206 |
| 5322 209 84165 | SN7474N | 1C207 |
| 5322 209 84729 | SP8600B | 1C208 |
| 4822 130 40937 | BC548B | TS201 |
| 5322 130 40348 | BC178B | TS202 |
| 5322 130 44179 | BFR90 | TS203 |
| 4822 130 40937 | BC548B | TS204 |
| 5322 130 40343 | BC108B | TS205 |
| 5322 130 44435 | 2N5770 | TS206 |
| 5322 130 34364 | BA379 | GR201 |
| 5322 130 34364 | BA379 | GR202 |
| 5322 130 34283 | HP5082-2835 | GR203 |
| 5322 130 34283 | HP5082-2835 | GR204 |
| 5322 130 34364 | BA379 | GR205 |
| 5322 130 34364 | BA379 | GR206 |
| 5322 130 34364 | BA379 | GR207 |
| 5322 130 30613 | BAW62 | GR208 |
| 5322 130 34283 | HP5082-2835 | GR209 |
| 5322 130 34283 | HP5082-2835 | GR210 |
| 5322 130 30666 | BZX79-C7V5 | GR211 |
| 5322 130 34364 | BA379 | GR212 |
| 5322 130 30666 | BZX79-C7V5 | GR213 |
| 5322 130 30411 | BZX79-C3V9 | GR214 |
| 5322 130 30411 | BZX79-C3V9 | GR215 |

CODING SYSTEM OF FAILURE REPORTING FOR QUALITY
ASSESSMENT OF T & M INSTRUMENTS
(excl. potentiometric recorders)

The information contents of the coded failure description is necessary for our computerized processing of quality data.

Since the reporting of repair and maintenance routines must be complete and exact, we give you an example of a correctly filled-out PHILIPS SERVICE Job sheet.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|----------------|---------------------|--|---|---|---|---|---|---|--|---|---|---|---|---|---|---|---|---|--|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | | | | | | | | | | | | | | | | | | | | | | | | |
| Country | Day Month Year | Typenumber /Version | Factory/Serial no. | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="display: inline-table; width: 40px; height: 20px;"> <tr><td>3</td><td>2</td></tr> </table> | 3 | 2 | <table border="1" style="display: inline-table; width: 100px; height: 20px;"> <tr><td>1</td><td>5</td><td>0</td><td>4</td><td>7</td><td>5</td></tr> </table> | 1 | 5 | 0 | 4 | 7 | 5 | <table border="1" style="display: inline-table; width: 150px; height: 20px;"> <tr><td>0</td><td>P</td><td>M</td><td>3</td><td>2</td><td>6</td><td>0</td><td>0</td><td>2</td></tr> </table> | 0 | P | M | 3 | 2 | 6 | 0 | 0 | 2 | <table border="1" style="display: inline-table; width: 120px; height: 20px;"> <tr><td>D</td><td>O</td><td>0</td><td>0</td><td>7</td><td>8</td><td>3</td></tr> </table> | D | O | 0 | 0 | 7 | 8 | 3 |
| 3 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 5 | 0 | 4 | 7 | 5 | | | | | | | | | | | | | | | | | | | | | | |
| 0 | P | M | 3 | 2 | 6 | 0 | 0 | 2 | | | | | | | | | | | | | | | | | | | |
| D | O | 0 | 0 | 7 | 8 | 3 | | | | | | | | | | | | | | | | | | | | | |

CODED FAILURE DESCRIPTION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---------------------------------------|--|--|--|--------------------------------|--|---|--|--|--|---|---|---|---|--|--|--|--|--|--|--|--|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|---|---|---|--|--|
| ⑤ | ⑥ | ⑦ | ⑧ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nature of call | Location | Component/sequence no. | Category | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%;"> <tr><td><input type="checkbox"/> Installation</td></tr> <tr><td><input type="checkbox"/> Pre sale repair</td></tr> <tr><td><input type="checkbox"/> Preventive maintenance</td></tr> <tr><td><input checked="" type="checkbox"/> Corrective maintenance</td></tr> <tr><td><input type="checkbox"/> Other</td></tr> </table> | <input type="checkbox"/> Installation | <input type="checkbox"/> Pre sale repair | <input type="checkbox"/> Preventive maintenance | <input checked="" type="checkbox"/> Corrective maintenance | <input type="checkbox"/> Other | <table border="1" style="width: 100%;"> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td>0</td><td>0</td><td>2</td><td>1</td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </table> | | | | | 0 | 0 | 2 | 1 | | | | | | | | | <table border="1" style="width: 100%;"> <tr><td>T</td><td>S</td><td>0</td><td>6</td><td>0</td><td>7</td></tr> <tr><td>R</td><td>0</td><td>0</td><td>6</td><td>3</td><td>1</td></tr> <tr><td>9</td><td>9</td><td>0</td><td>0</td><td>0</td><td>1</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table> | T | S | 0 | 6 | 0 | 7 | R | 0 | 0 | 6 | 3 | 1 | 9 | 9 | 0 | 0 | 0 | 1 | | | | | | | | | | | | | <table border="1" style="width: 100%;"> <tr><td>5</td></tr> <tr><td>2</td></tr> <tr><td>4</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table> | 5 | 2 | 4 | | |
| <input type="checkbox"/> Installation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Pre sale repair | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Preventive maintenance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input checked="" type="checkbox"/> Corrective maintenance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Other | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T | S | 0 | 6 | 0 | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R | 0 | 0 | 6 | 3 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 9 | 0 | 0 | 0 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | Job completed <input checked="" type="checkbox"/> Working time ⑧ <table border="1" style="display: inline-table; width: 60px; height: 20px;"> <tr><td> </td><td> </td><td>1</td><td>2</td></tr> </table> Hrs | | | 1 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Detailed description of the information to be entered in the various boxes:

①Country:

| | |
|---|---|
| 3 | 2 |
|---|---|

 = Switzerland

②Day Month Year

| | | | | | |
|---|---|---|---|---|---|
| 1 | 5 | 0 | 4 | 7 | 5 |
|---|---|---|---|---|---|

 = 15 April 1975

③Type number/Version

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 | P | M | 3 | 2 | 6 | 0 | 0 | 2 |
|---|---|---|---|---|---|---|---|---|

 = Oscilloscope PM 3260, version 02 (in later oscilloscopes this number is placed in front of the serial no)

④Factory/Serial number

| | | | | | | |
|---|---|---|---|---|---|---|
| D | O | 0 | 0 | 7 | 8 | 3 |
|---|---|---|---|---|---|---|

 = DO 783 These data are mentioned on the type plate of the instrument

⑤ Nature of call: Enter a cross in the relevant box

⑥ Coded failure description

Location

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

These four boxes are used to isolate the problem area. Write the code of the part in which the fault occurs, e.g. unit no or mechanical item no of this part (refer to 'PARTS LISTS' in the manual).

Example: 0001 for Unit 1
 000A for Unit A
 0075 for item 75

If units are not numbered, do not fill in the four boxes; see Example Job sheet.

Component/sequence no.

| | | | | | |
|--|--|--|--|--|--|
| | | | | | |
|--|--|--|--|--|--|

These six boxes are intended to pinpoint the faulty component.

A. Enter the component designation as used in the circuit diagram. If the designation is alfa-numeric, the letters must be written (starting from the left) in the two left-hand boxes and the figures must be written (in such a way that the last digit occupies the right-most box) in the four right-hand boxes.

B. Parts not identified in the circuit diagram:

990000 Unknown/Not applicable
 990001 Cabinet or rack (text plate, emblem, grip, rail, graticule, etc.)
 990002 Knob (incl. dial knob, cap, etc.)
 990003 Probe (only if attached to instrument)
 990004 Leads and associated plugs
 990005 Holder (valve, transistor, fuse, board, etc.)
 990006 Complete unit (p.w. board, h.t. unit, etc.)
 990007 Accessory (only those without type number)
 990008 Documentation (manual, supplement, etc.)
 990009 Foreign object
 990099 Miscellaneous

Category

| |
|--|
| |
|--|

0 Unknown, not applicable (fault not present, intermittent or disappeared)

- 1 Software error
- 2 Readjustment
- 3 Electrical repair (wiring, solder joint, etc.)
- 4 Mechanical repair (polishing, filing, remachining, etc.)
- 5 Replacement (of transistor, resistor, etc.)
- 6 Cleaning and/or lubrication
- 7 Operator error
- 8 Missing items (on pre-sale test)
- 9 Environmental requirements are not met

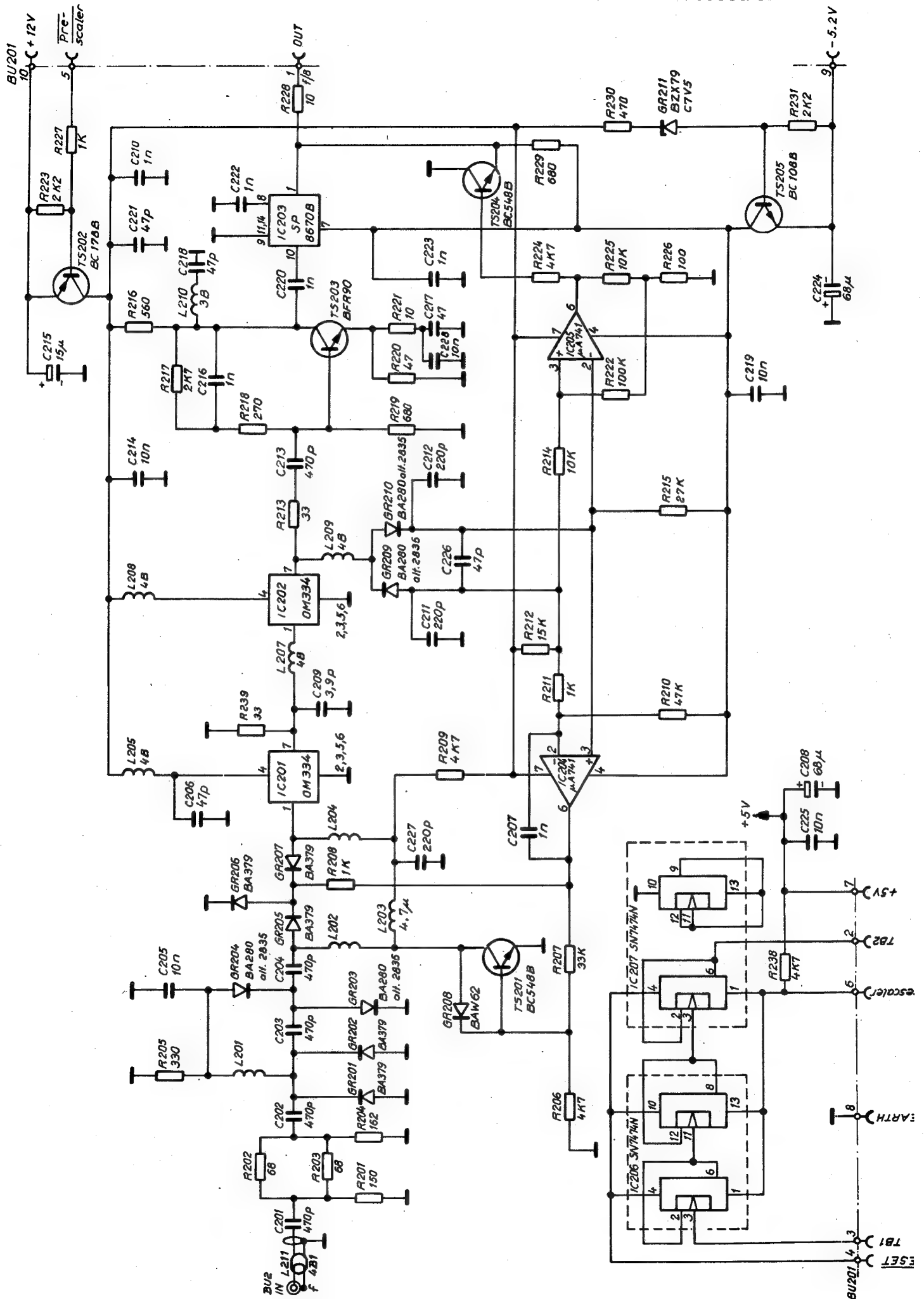
⑦ Job completed: Enter a cross when the job has been completed.

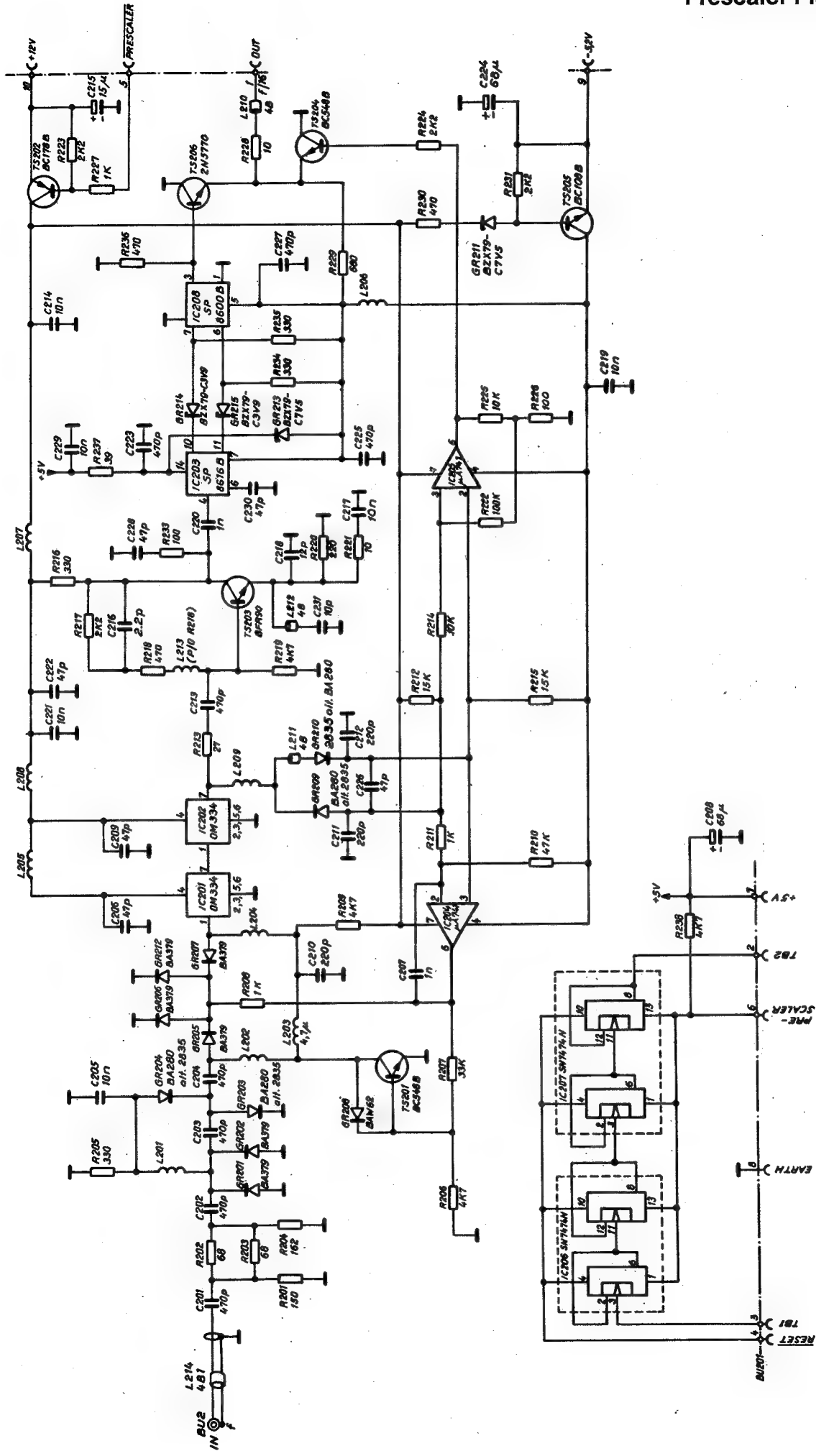
⑧ Working time: Enter the total number of working hours spent in connection with the job (excluding travelling, waiting time, etc.), using the last box for tenths of hours.

| | | | |
|--|--|---|---|
| | | 1 | 2 |
|--|--|---|---|

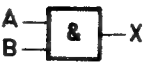


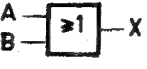











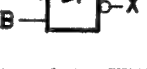
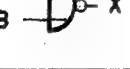

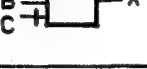




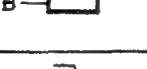
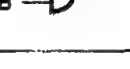








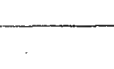


 = 1,2 working hours (1 h 12 min.)

Prescaler PM 6624





Standard symbols for logic elements

| Circuit | I.E.C. | DIN norm 40700 | American standard | Boolean function |
|--|---|---|--|-------------------------------------|
| AND |  |  |  | $X = AB$ |
| OR |  |  |  | $X = A + B$ |
| NAND |  |  |  | $X = \overline{AB}$ |
| NOR |  |  |  | $X = \overline{A + B}$ |
| NAND with one inverting input |  |  |  | $X = \overline{\overline{A}B}$ |
| NOR with one inverting input |  |  |  | $X = \overline{\overline{A} + B}$ |
| INHIBIT GATE |  | |  | $X = (A + B) \overline{C}$ |
| EXCLUSIVE OR |  |  |  | $X = A\overline{B} + \overline{A}B$ |
| COMPARATOR |  |  |  | $X = AB + \overline{A}\overline{B}$ |
| Distributed AND |  | |  | |
| Distributed OR |  | |  | |
| DELAY |  |  |  | |
| FLIP-FLOP |  |  |  | |

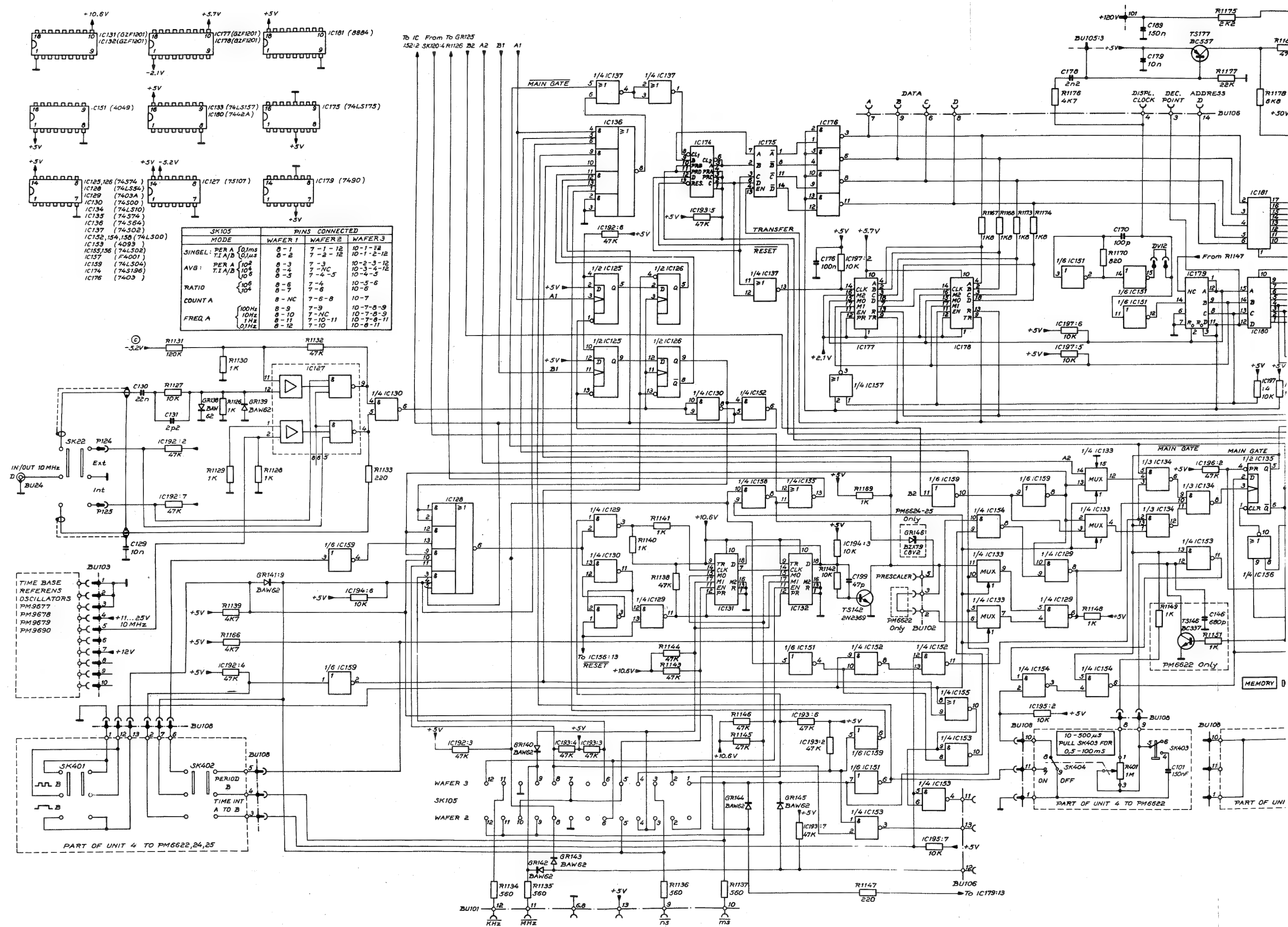
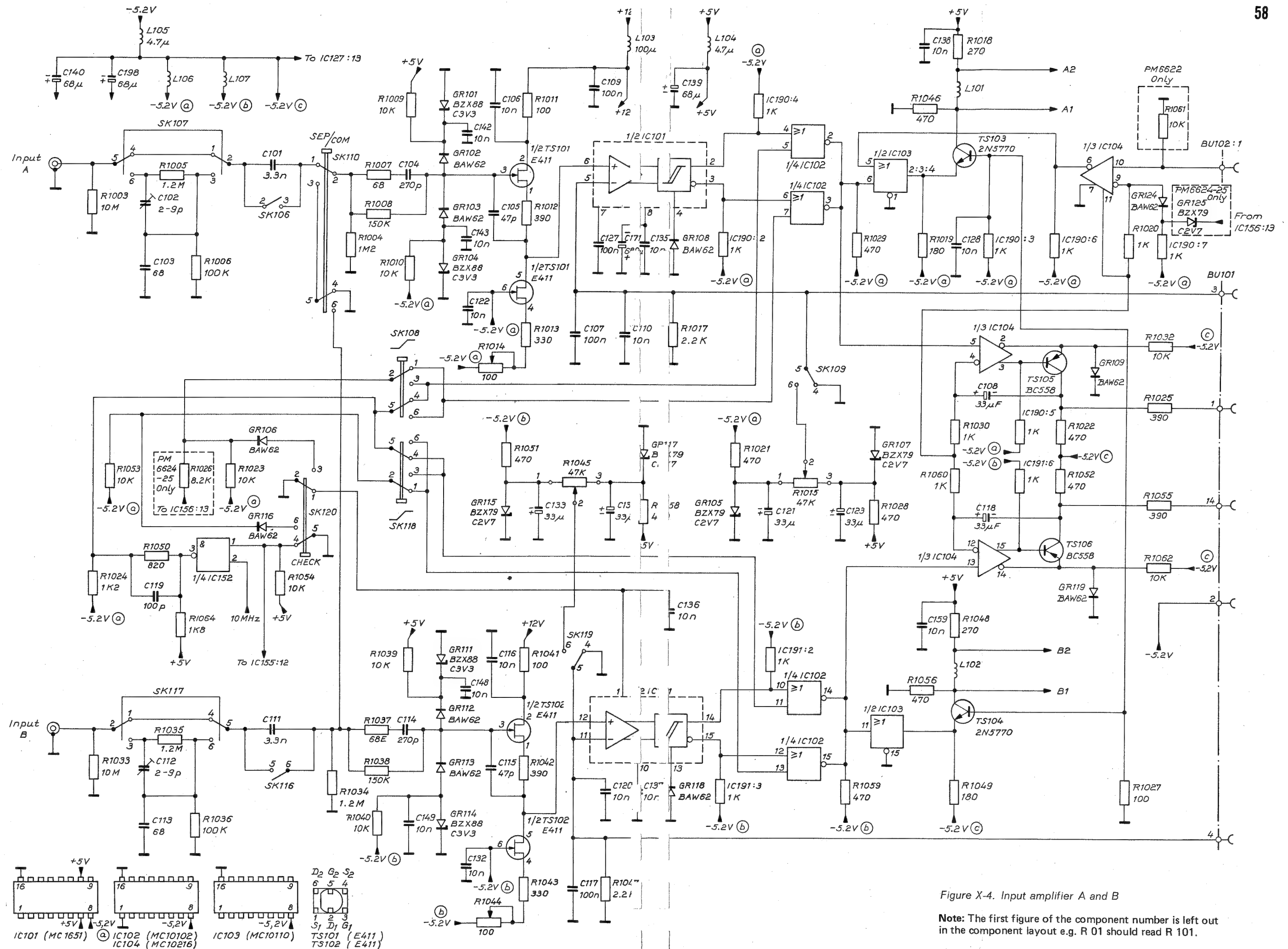


Figure X-3. Circuit diagram Input/Output amplifier D, Oscillator, decimal counting unit, display and time base divider



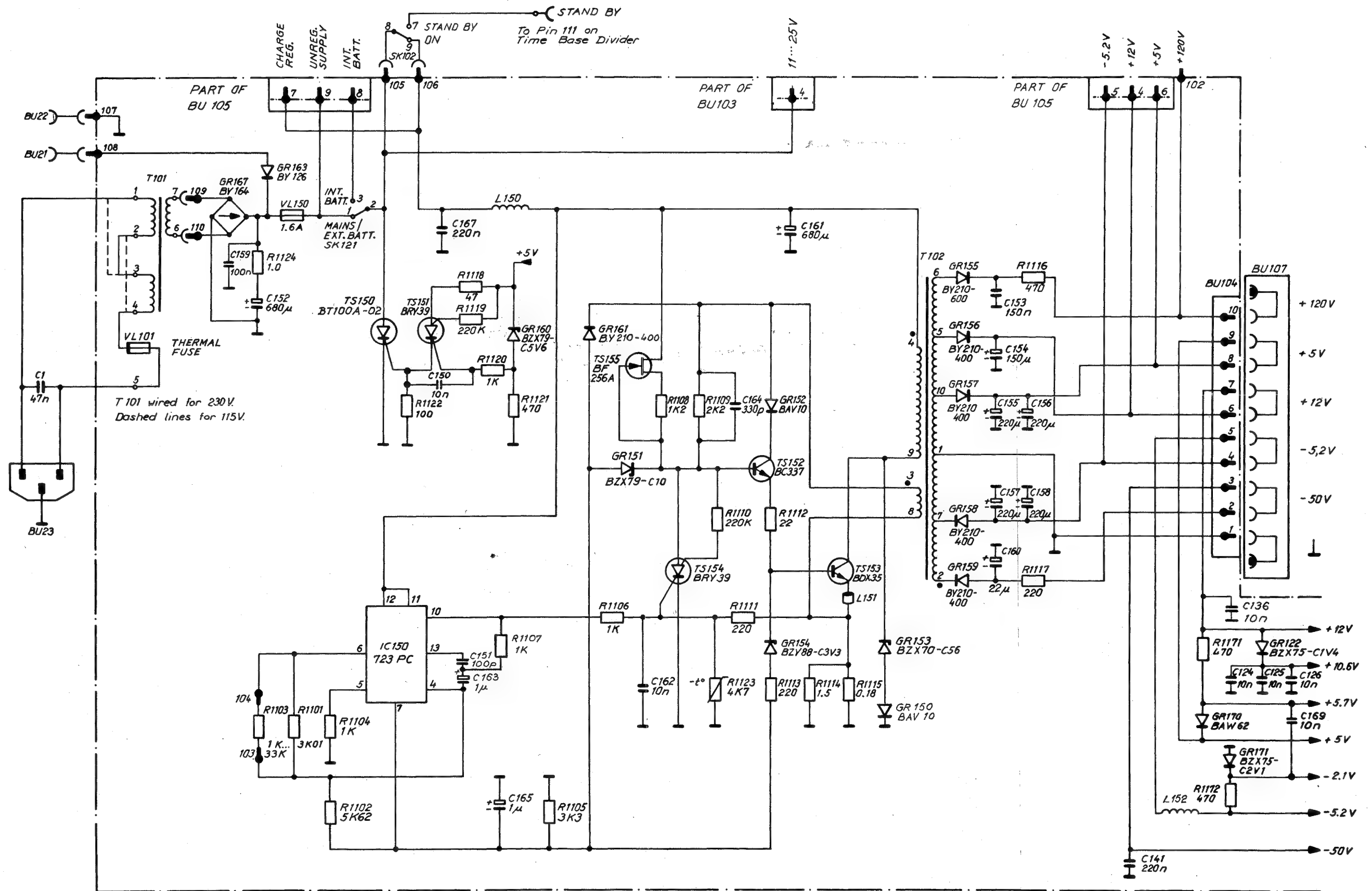


Figure X-5. Power supply

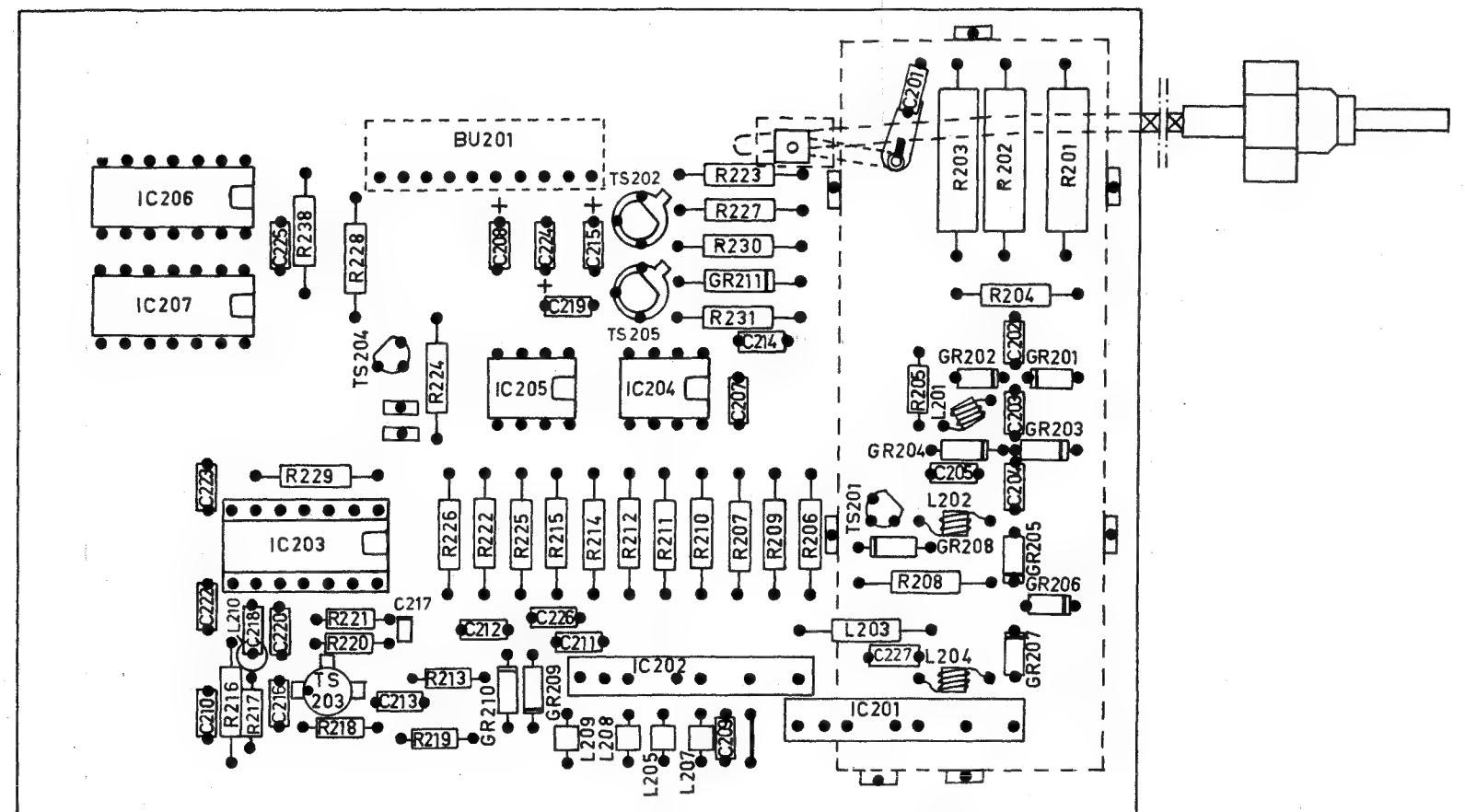


Figure X-6. Component layout prescaler PM 6624, Component side

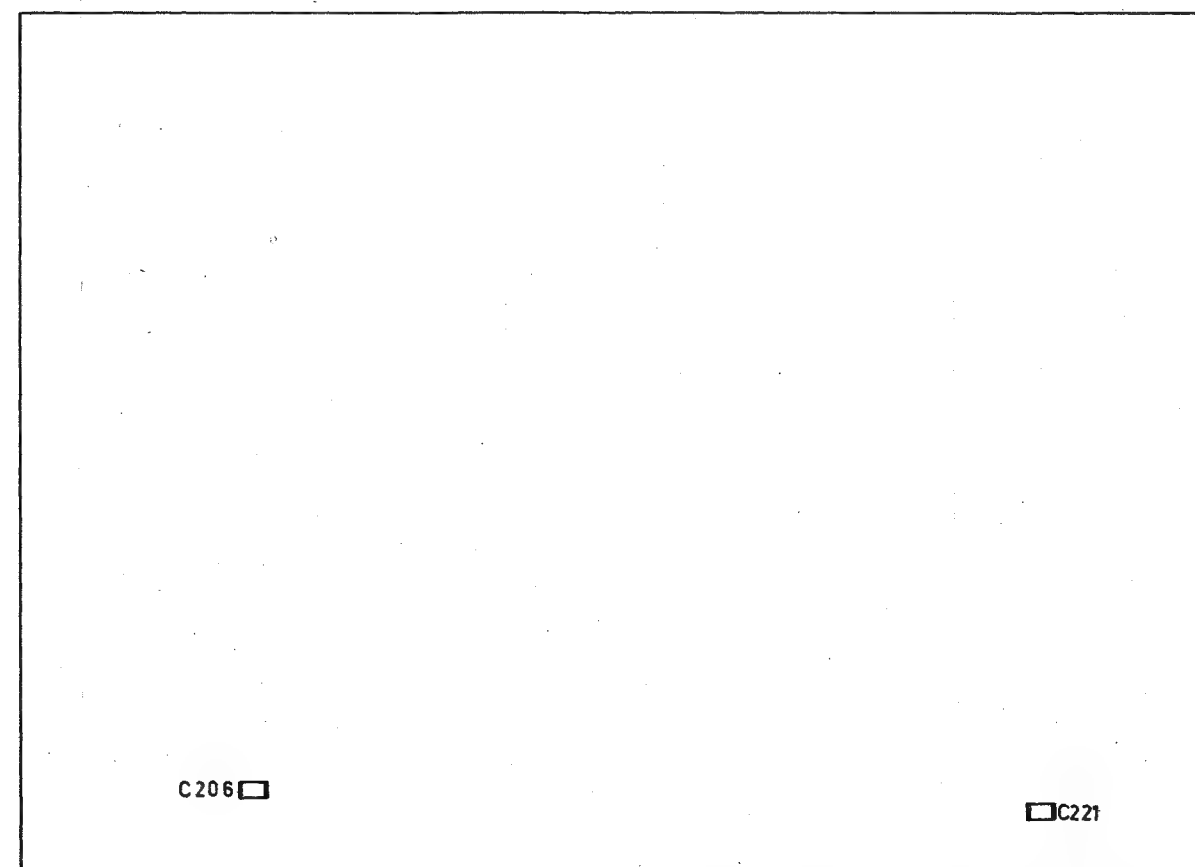
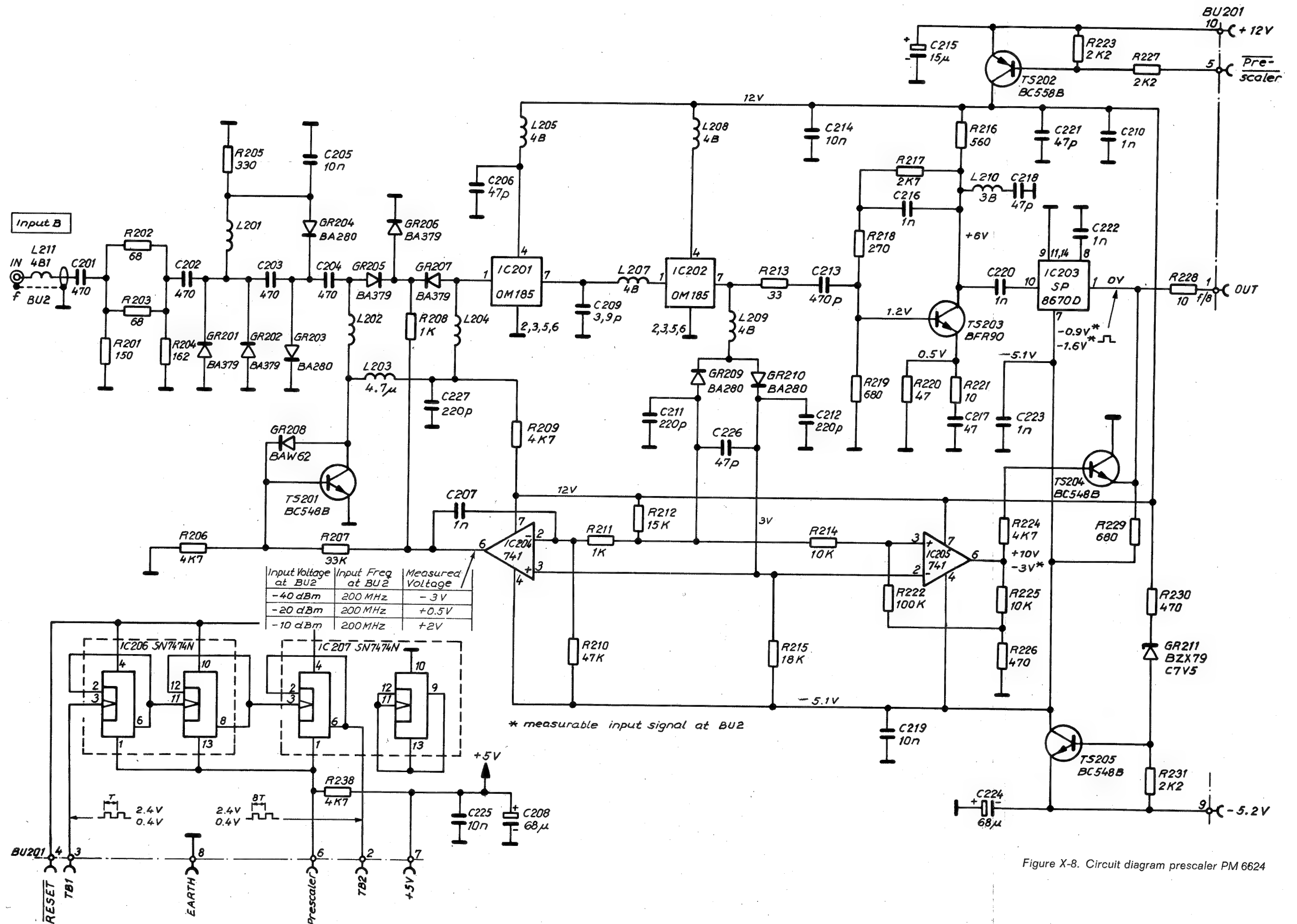


Figure X-7. Component layout prescaler PM 6624, Soldering side



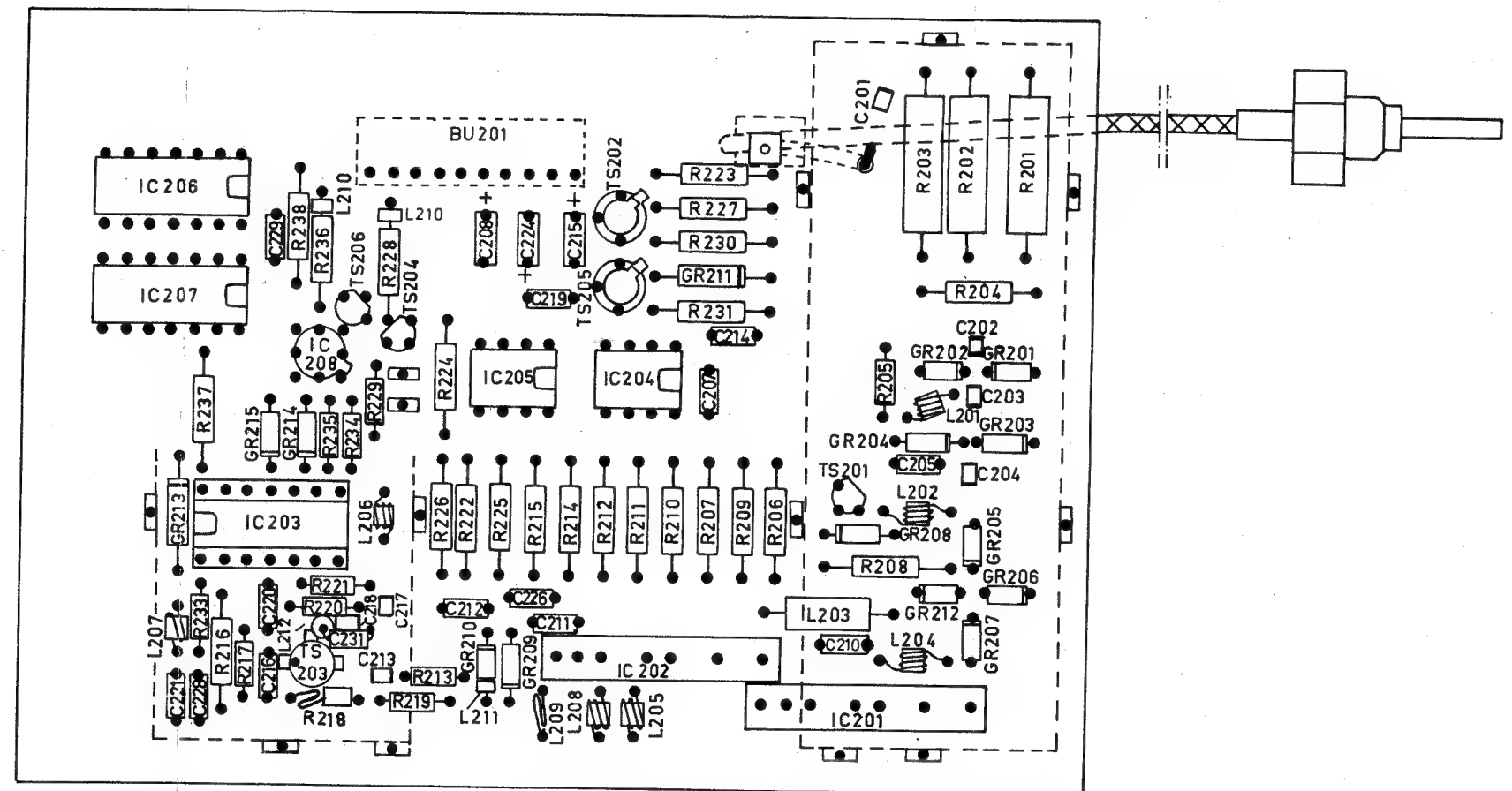


Figure X-9. Component layout prescaler PM 6625, Component side

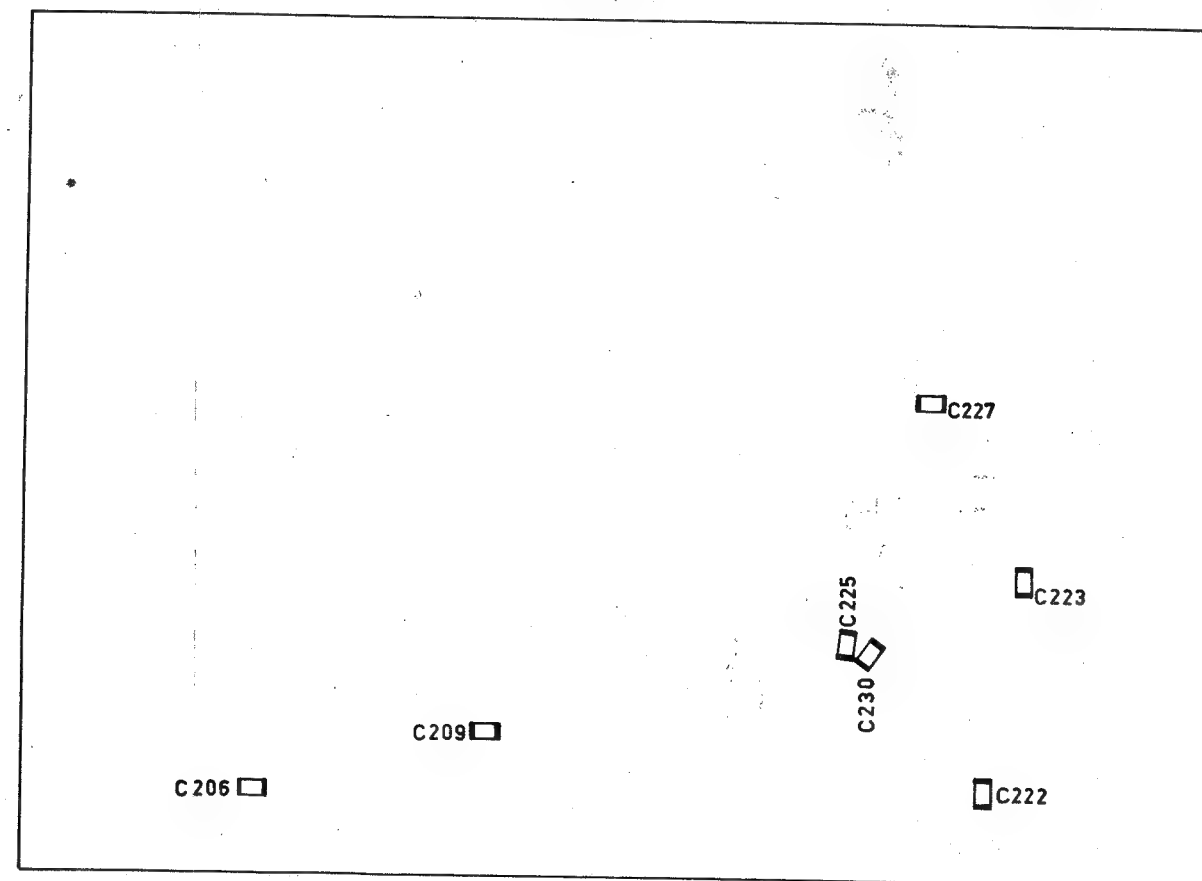
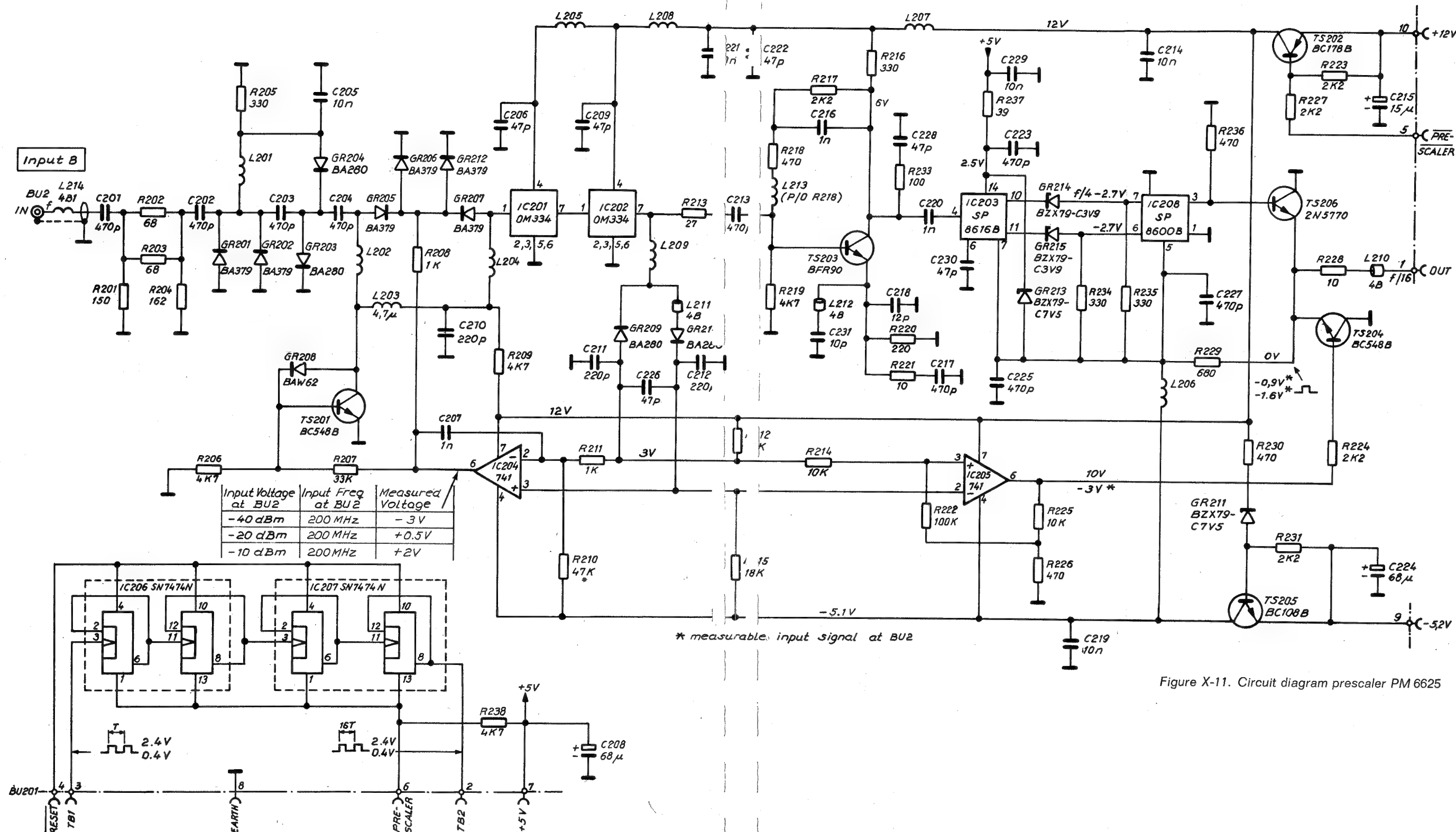


Figure X-10. Component layout prescaler PM 6625, Soldering side



QUALITY REPORTING

CODING SYSTEM FOR FAILURE DESCRIPTION

The following information is meant for Philips service workshops only and serves as a guide for exact reporting of service repairs and maintenance routines on the workshop charts.
For full details reference is made to Information G1 (Introduction) and Information Cd 689 (Specific information for Test and Measuring Instruments).

LOCATION

Unit number

e.g. 000A or 0001 (for unit A or 1; not 00UA or 00U1)

or: Type number of an accessory (only if delivered with the equipment)

e.g. 9051 or 9532 (for PM 9051 or PM 9532)

or: Unknown/Not applicable
0000

COMPONENT/SEQUENCE NUMBER

Enter the identification as used in the circuit diagram, e.g.:

GR1003 Diode GR1003
TS0023 Transistor TS23
IC0101 Integrated circuit IC101
R0.... Resistor, potentiometer
C0.... Capacitor, variable capacitor
B0.... Tube, valve
LA.... Lamp
VL.... Fuse
SK.... Switch
BU.... Connector, socket, terminal
T0.... Transformer
L0.... Coil
X0.... Crystal
CB.... Circuit block
RE.... Relay
BA.... Battery
TR.... Chopper

CATEGORY

☐

- 0 Unknown, not applicable (fault not present, intermittent or disappeared)
- 1 Software error
- 2 Readjustment
- 3 Electrical repair (wiring, solder joint, etc.)
- 4 Mechanical repair (polishing, filing, remachining, etc.)
- 5 Replacement
- 6 Cleaning and/or lubrication
- 7 Operator error
- 8 Missing items (on pre-sale test)
- 9 Environmental requirements are not met

Parts not identified in the circuit diagram:

- 990000 Unknown/Not applicable
- 990001 Cabinet or rack (text plate, emblem, grip, rail, graticule, etc.)
- 990002 Knob (incl. dial knob, cap, etc.)
- 990003 Probe (only if attached to instrument)
- 990004 Leads and associated plugs
- 990005 Holder (valve, transistor, fuse, board, etc.)
- 990006 Complete unit (p.w. board, h.t. unit, etc.)
- 990007 Accessory (only those without type number)
- 990008 Documentation (manual, supplement, etc.)
- 990009 Foreign object
- 990099 Miscellaneous

Sales and service all over the world

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Alger; tel. 656613-656607

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al 7749

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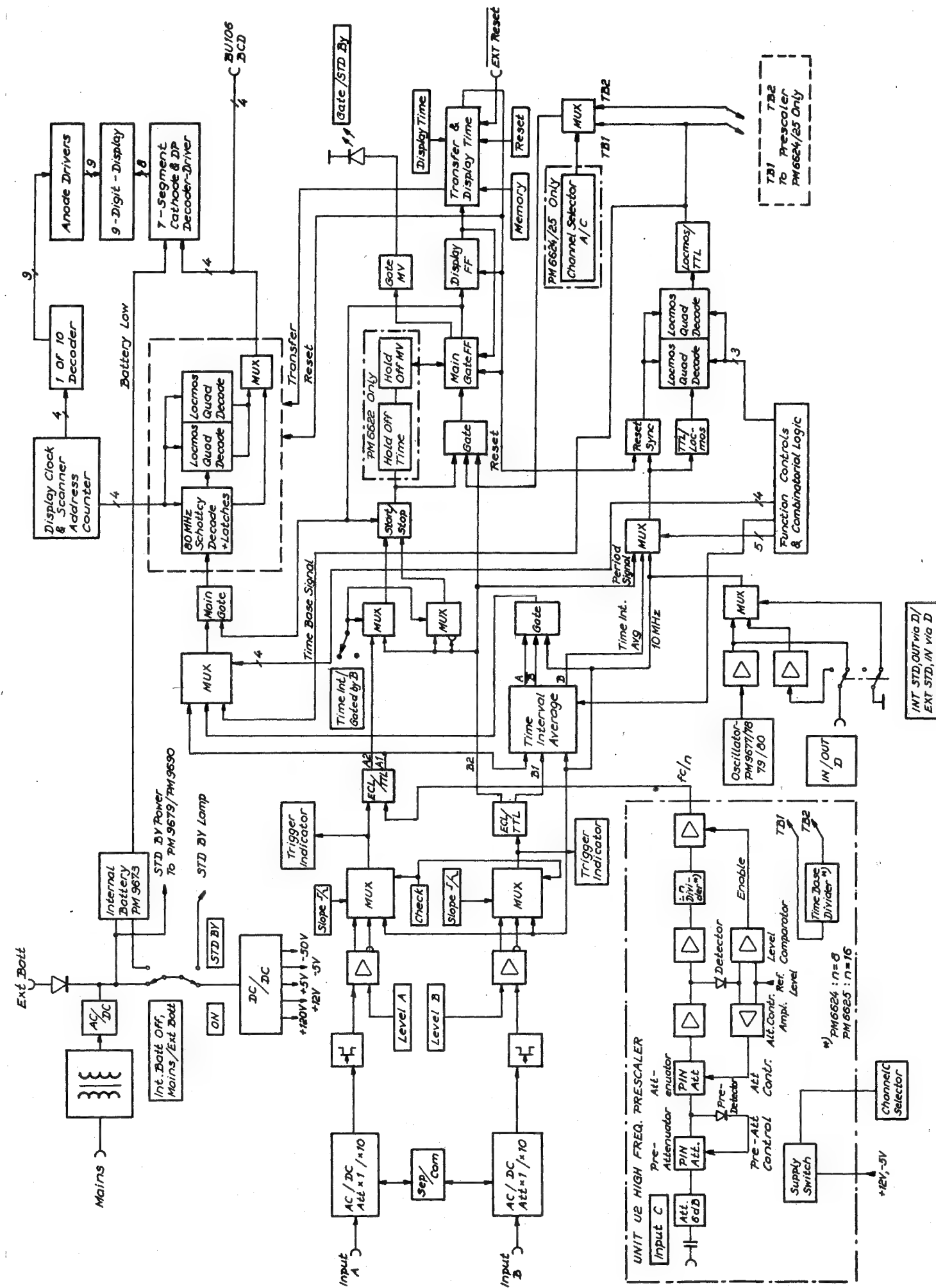
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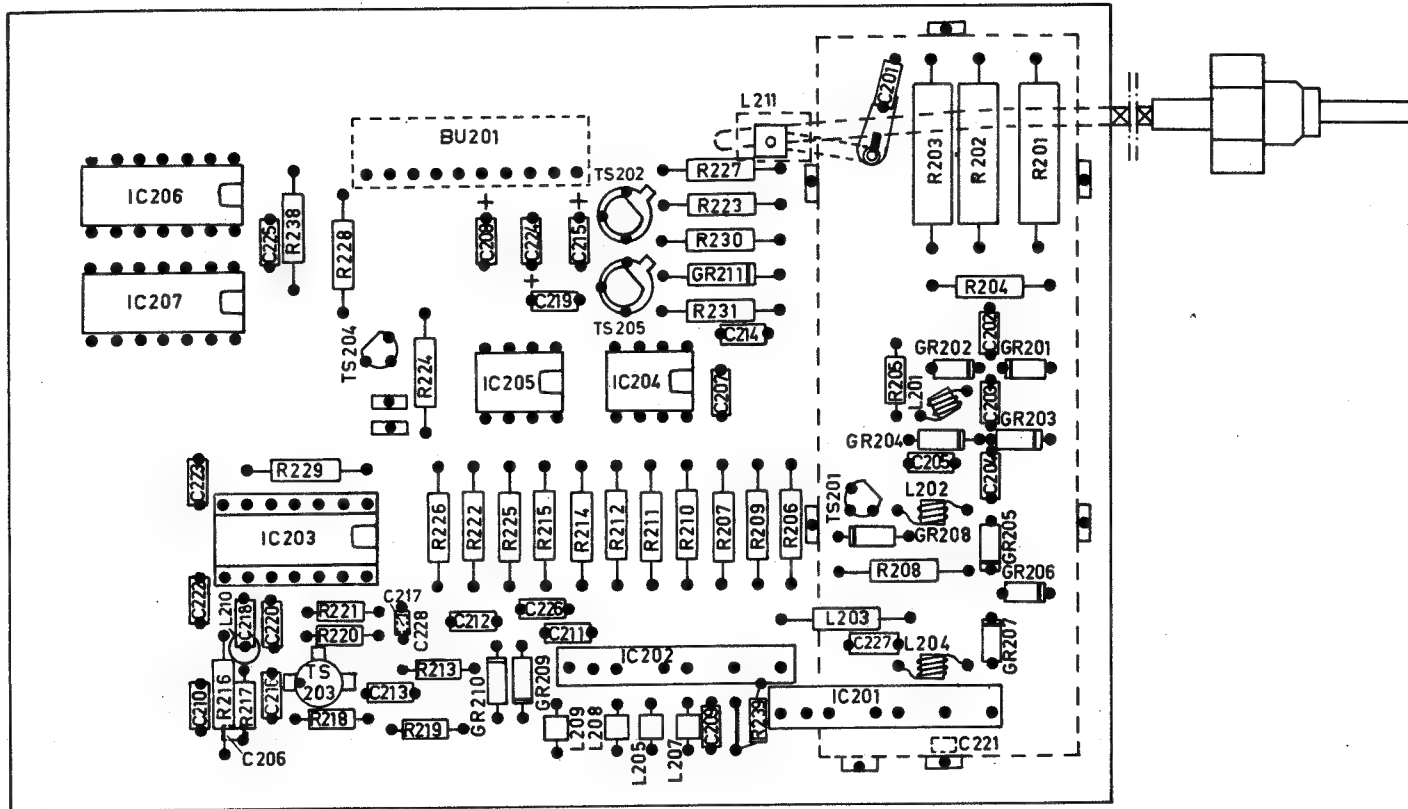
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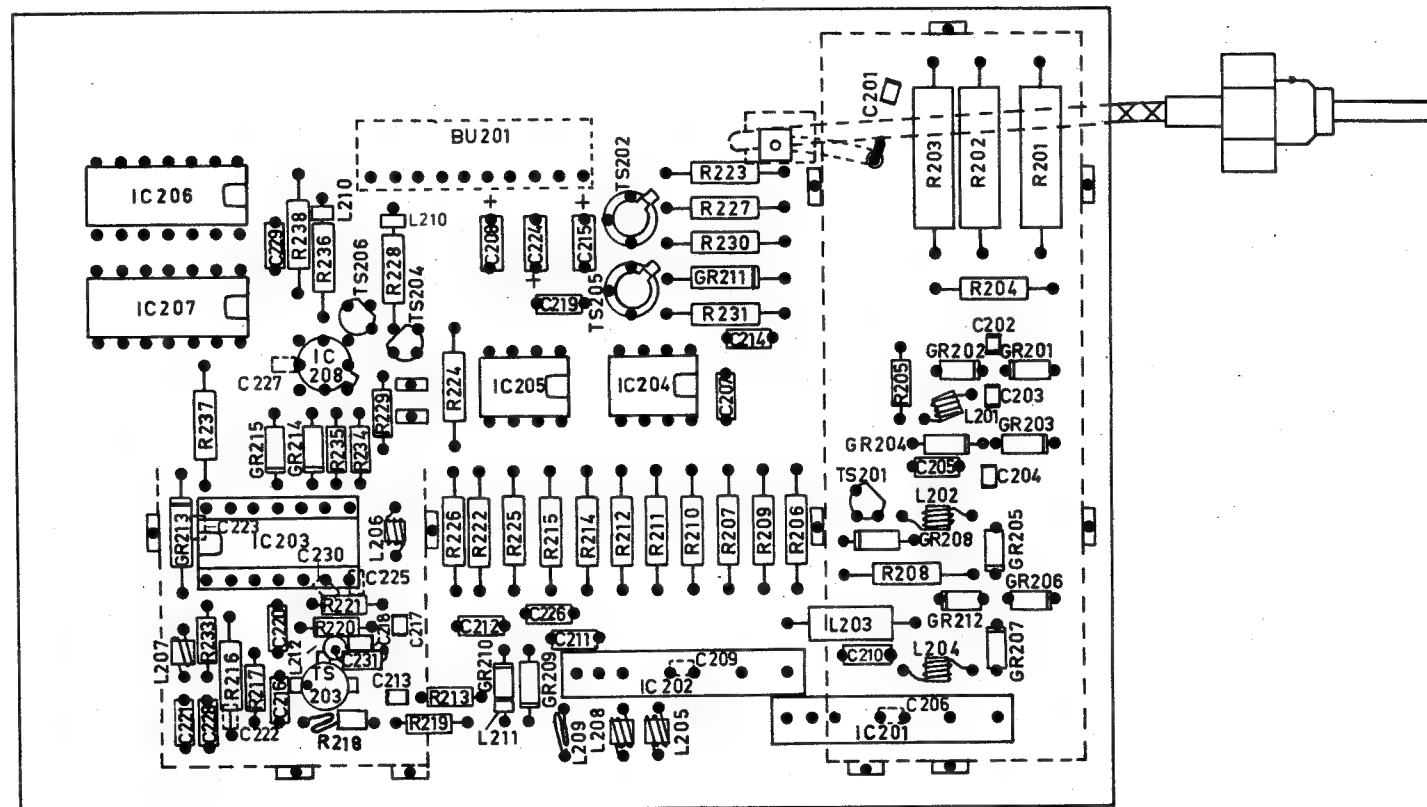
Block diagram



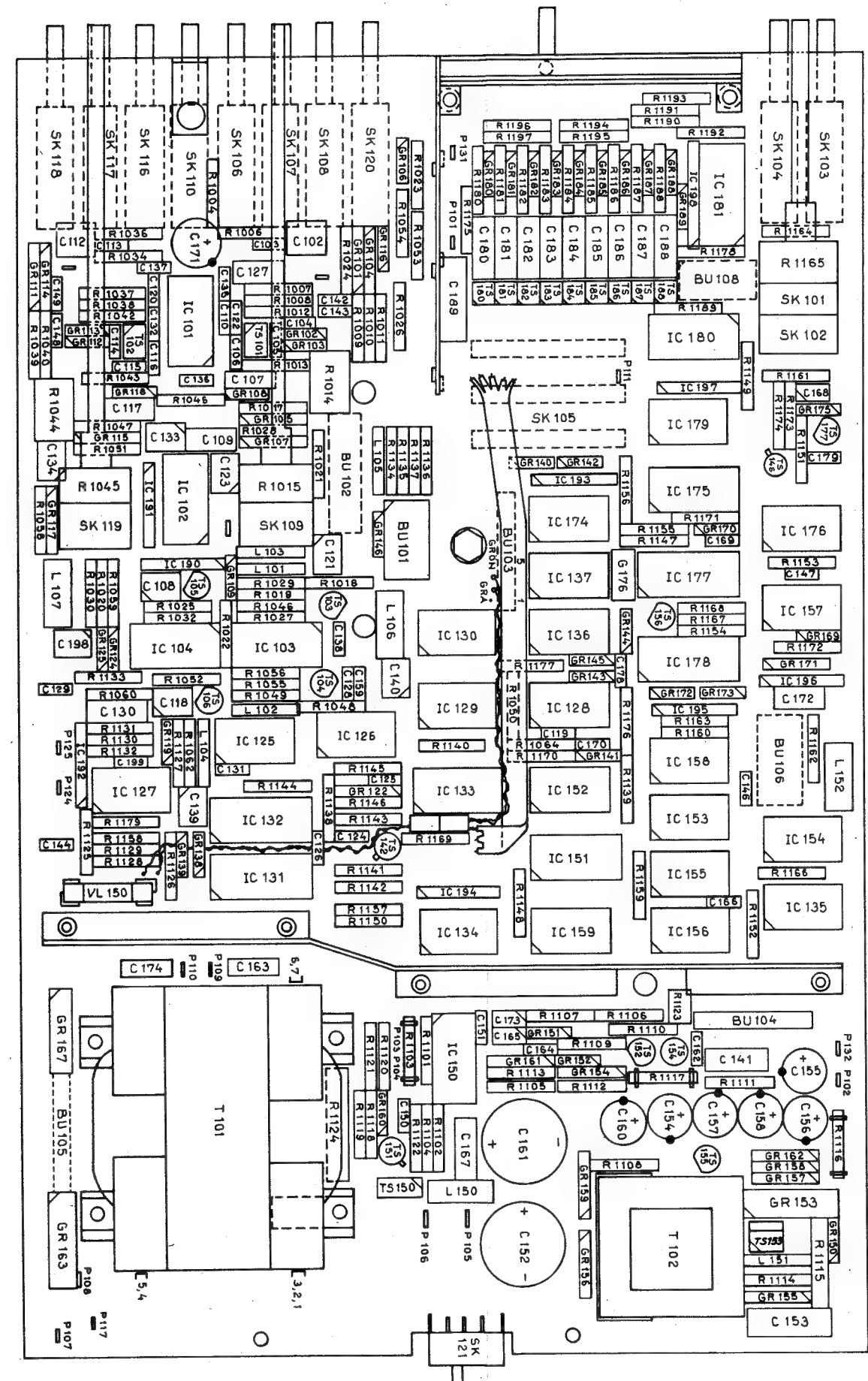
Prescaler PM 6624

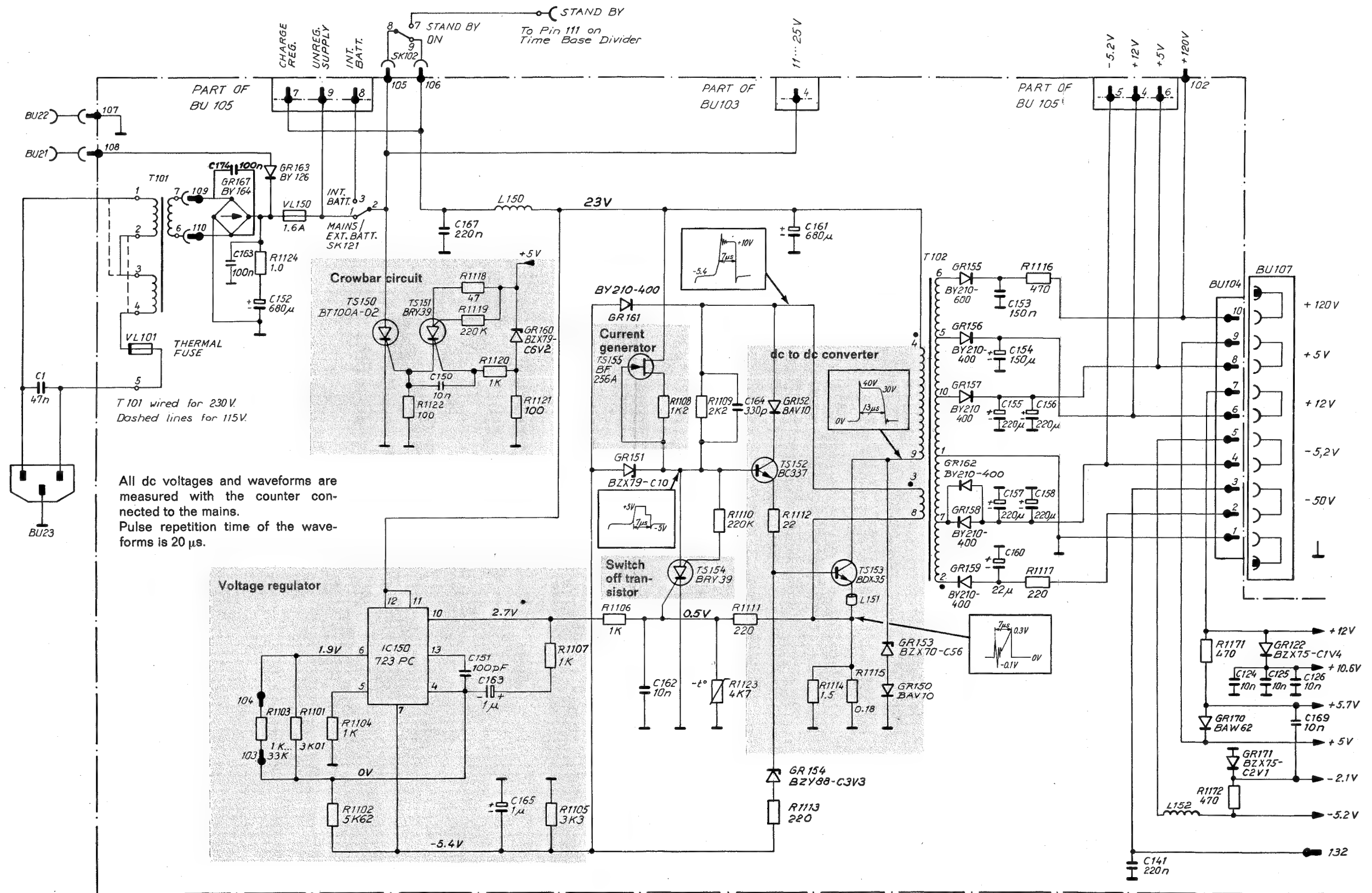


Prescaler PM 6625

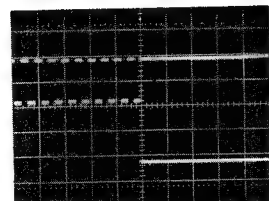


Basic board

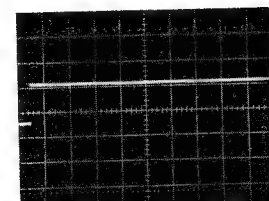




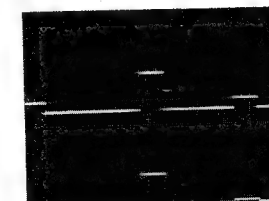
The waveforms are recorded with a 50 MHz 2 channels oscilloscope. The preliminary setting of the counter is minimum display time, Check mode and Frequency A 100 Hz. The rest of the controls is set to neutral position.



Inputs signal: 1 KHz



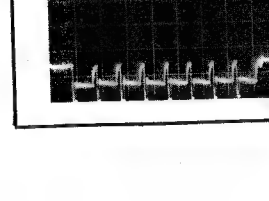
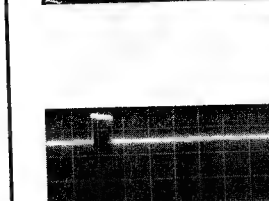
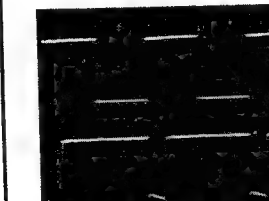
Frequency A 0.1 Hz



Frequency A 10 Hz
Display: 10.00000



Single Period 0.1 ms
Hold off is on



①
2 ms/div
2 V/div

IC 134:5
2 ms/div
2 V/div

②
2 μs/div
5 V/div

③
0.2 ms/div
5 V/div

④
0.2 ms/div
5 V/div

⑤
0.5 ms/div
2 V/div

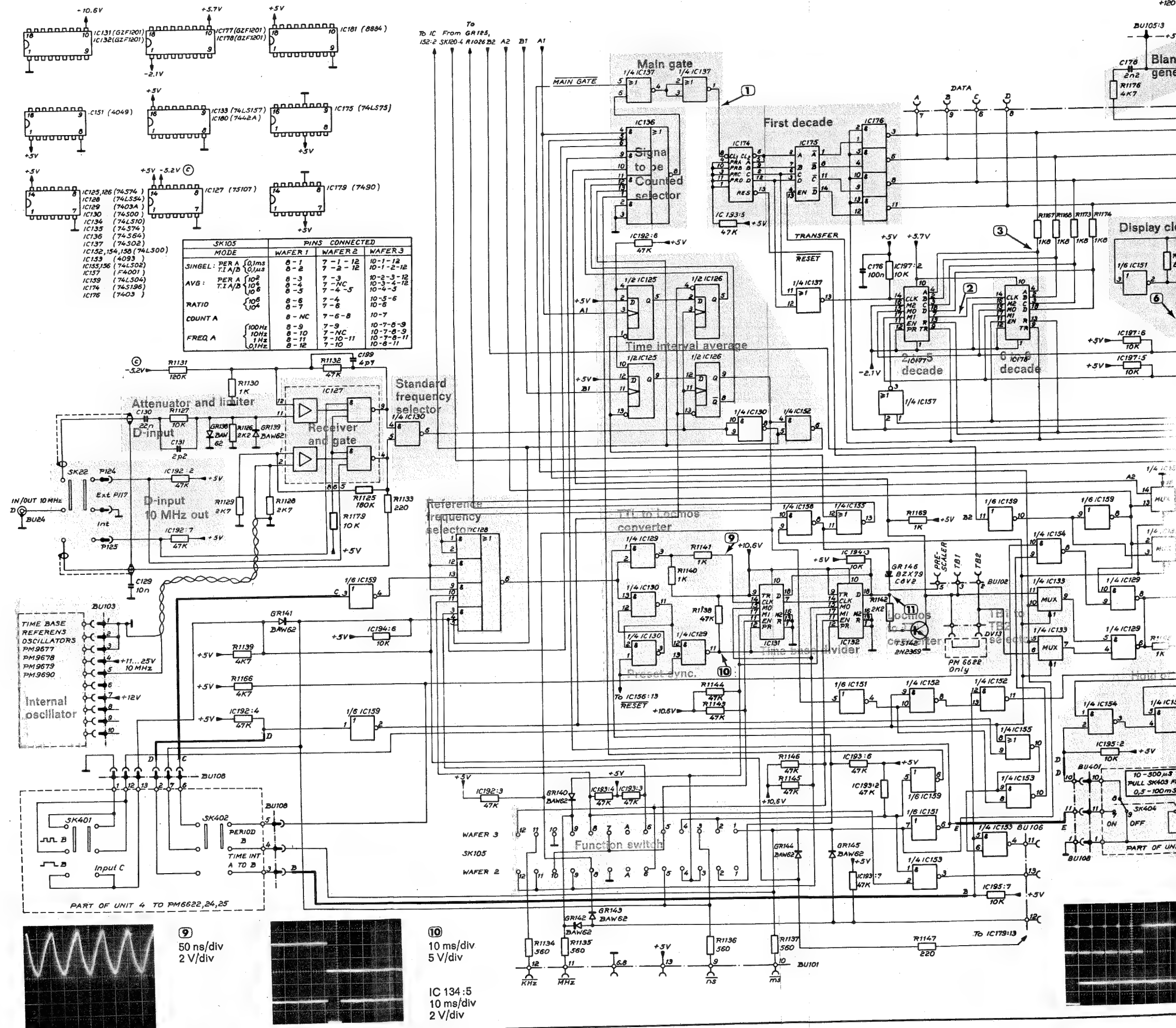
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0.5 ms/div
2 V/div

⑥
50 μs/div
2 V/div

⑦
50 μs/div
2 V/div

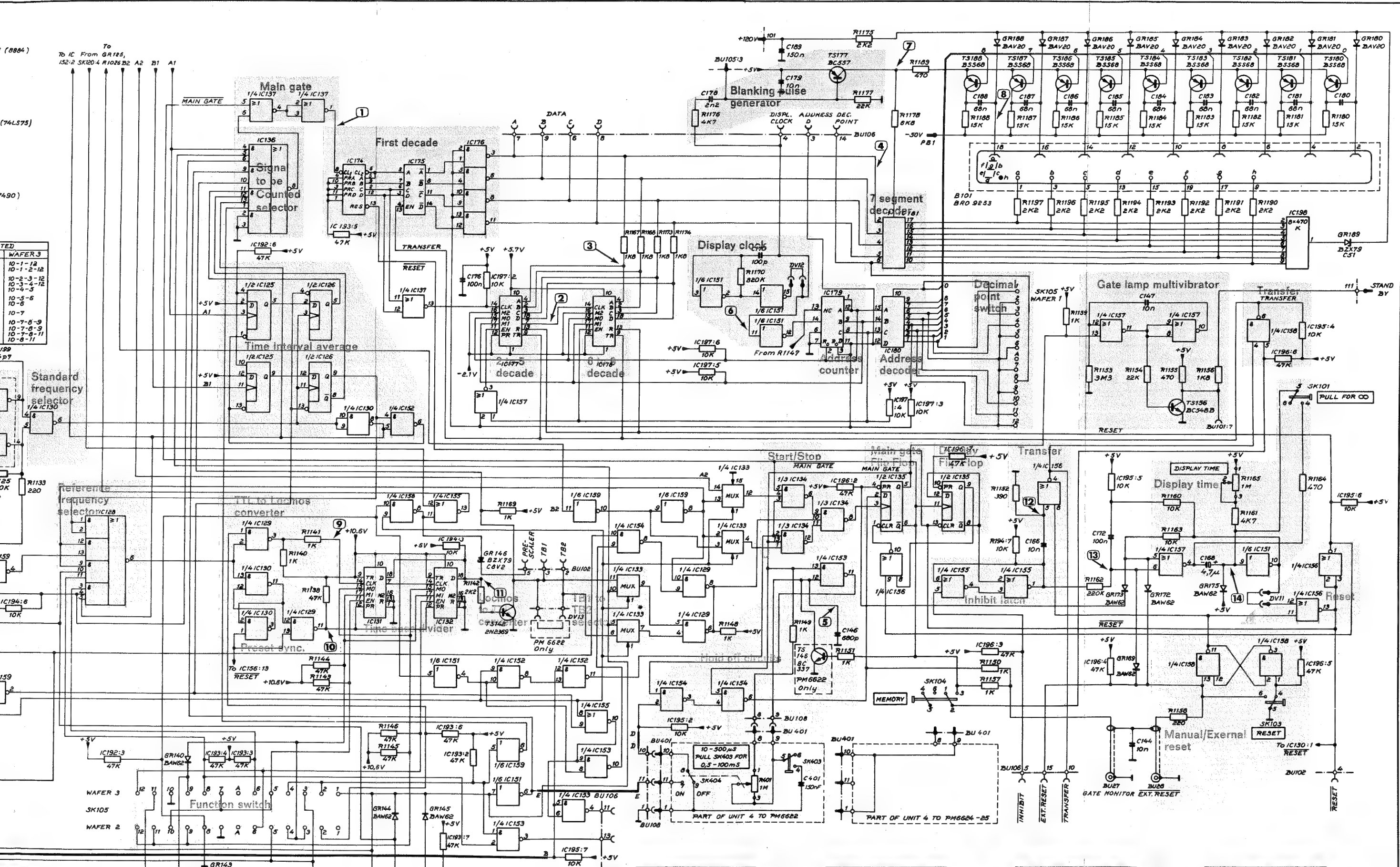
⑧
0.2 ms/div
50 V/div

IC 181:17
0.2 ms/div
50 V/div



⑩
10 ms/div
5 V/div

IC 134:5
10 ms/div
2 V/div



WAFFER 3

| |
|-----------|
| 10-1-12 |
| 10-1-2-12 |
| 10-2-3-12 |
| 10-3-4-12 |
| 10-4-5 |
| 10-5-6 |
| 10-6-7 |
| 10-7-8-9 |
| 10-7-8-9 |
| 10-7-8-11 |
| 10-8-11 |

10 10 ms/div
5 V/div

IC 134:5
10 ms/div
2 V/div

11 10 ms/div
5 V/div

IC 134:5
10 ms/div
2 V/div

IC 156:4
5 μs/div
2 V/div

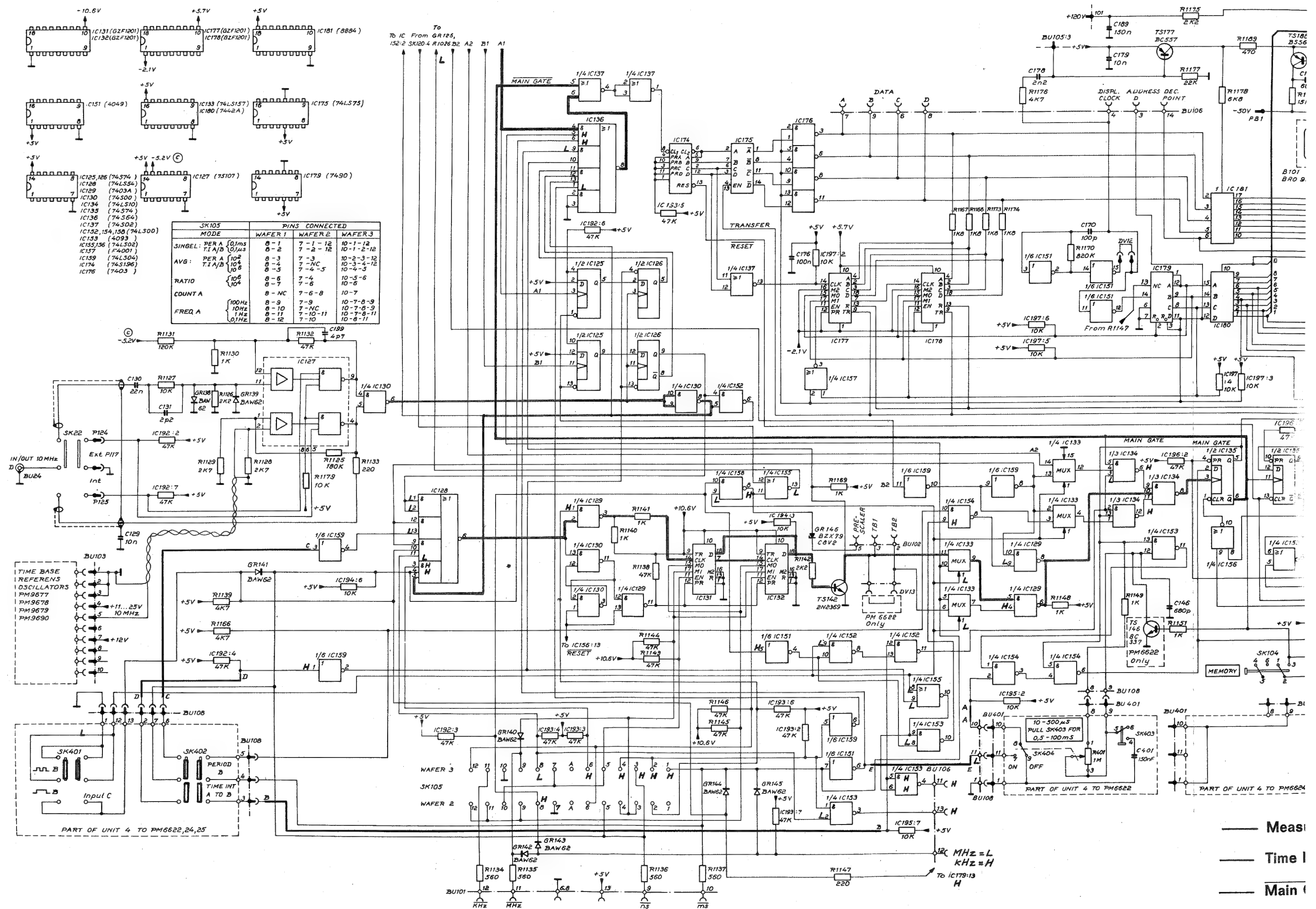
12 5 μs/div
2 V/div

13 20 ms/div
2 V/div

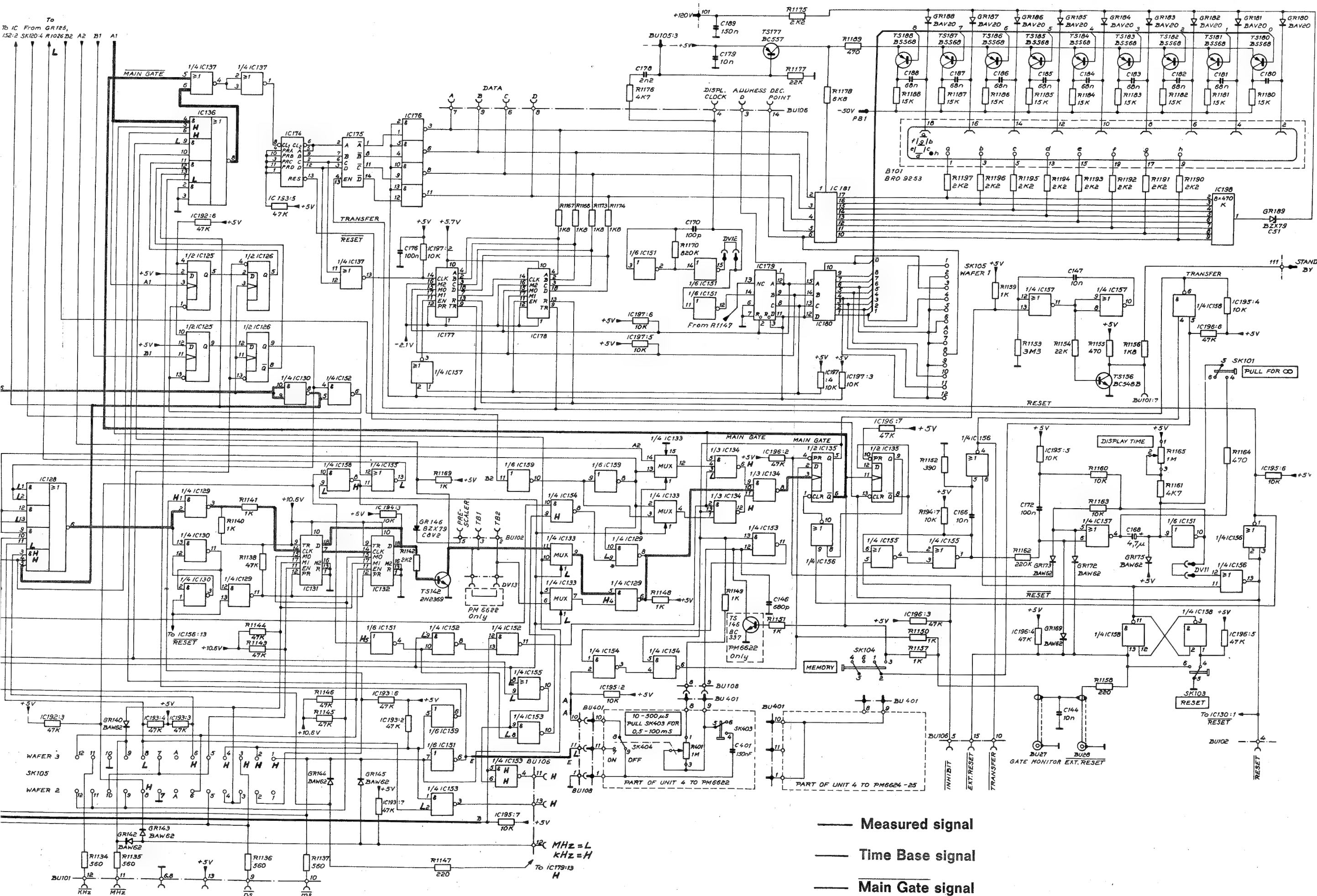
IC 134:5
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2 V/div

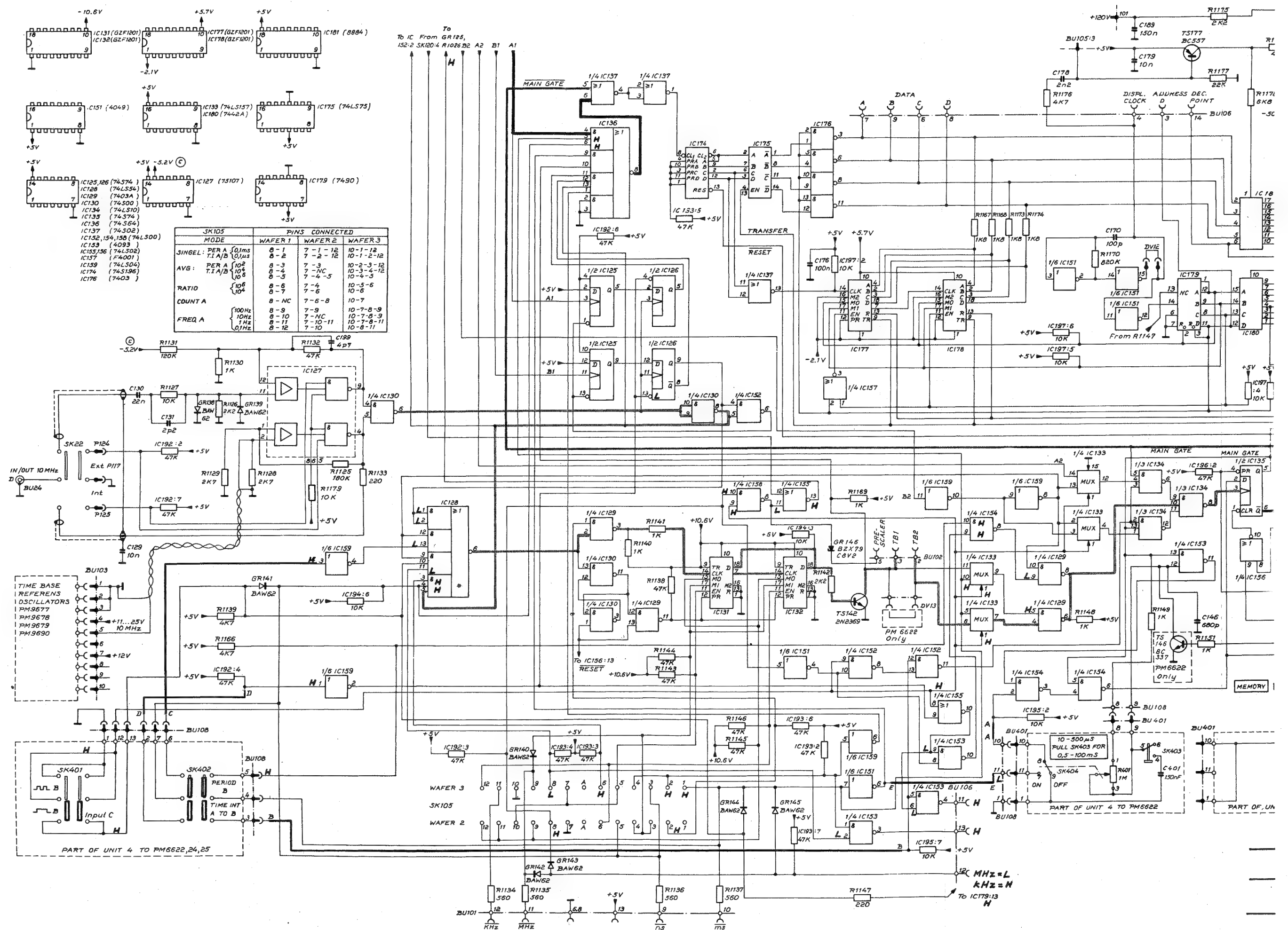
14 20 ms/div
2 V/div

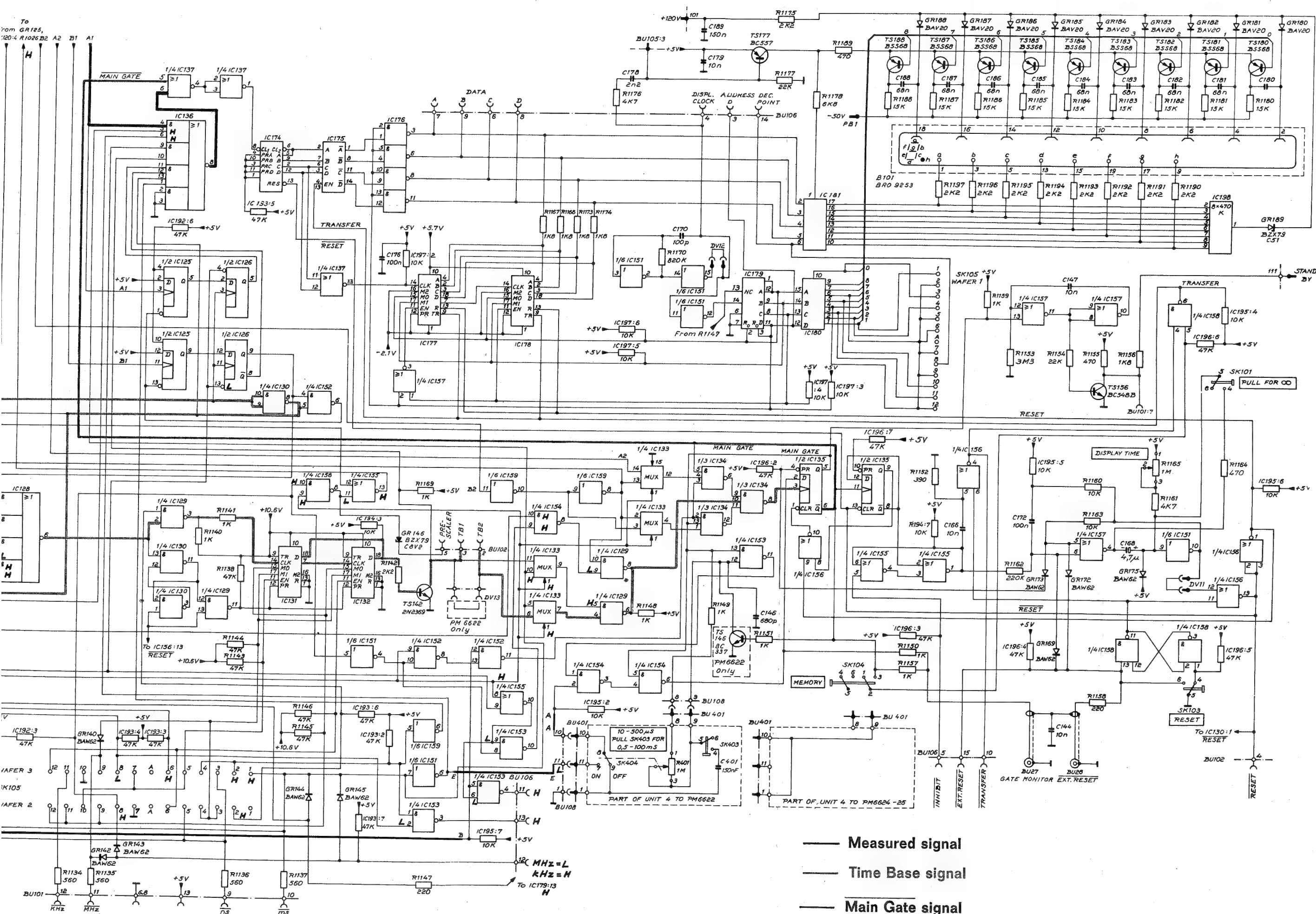
IC 134:5
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2 V/div

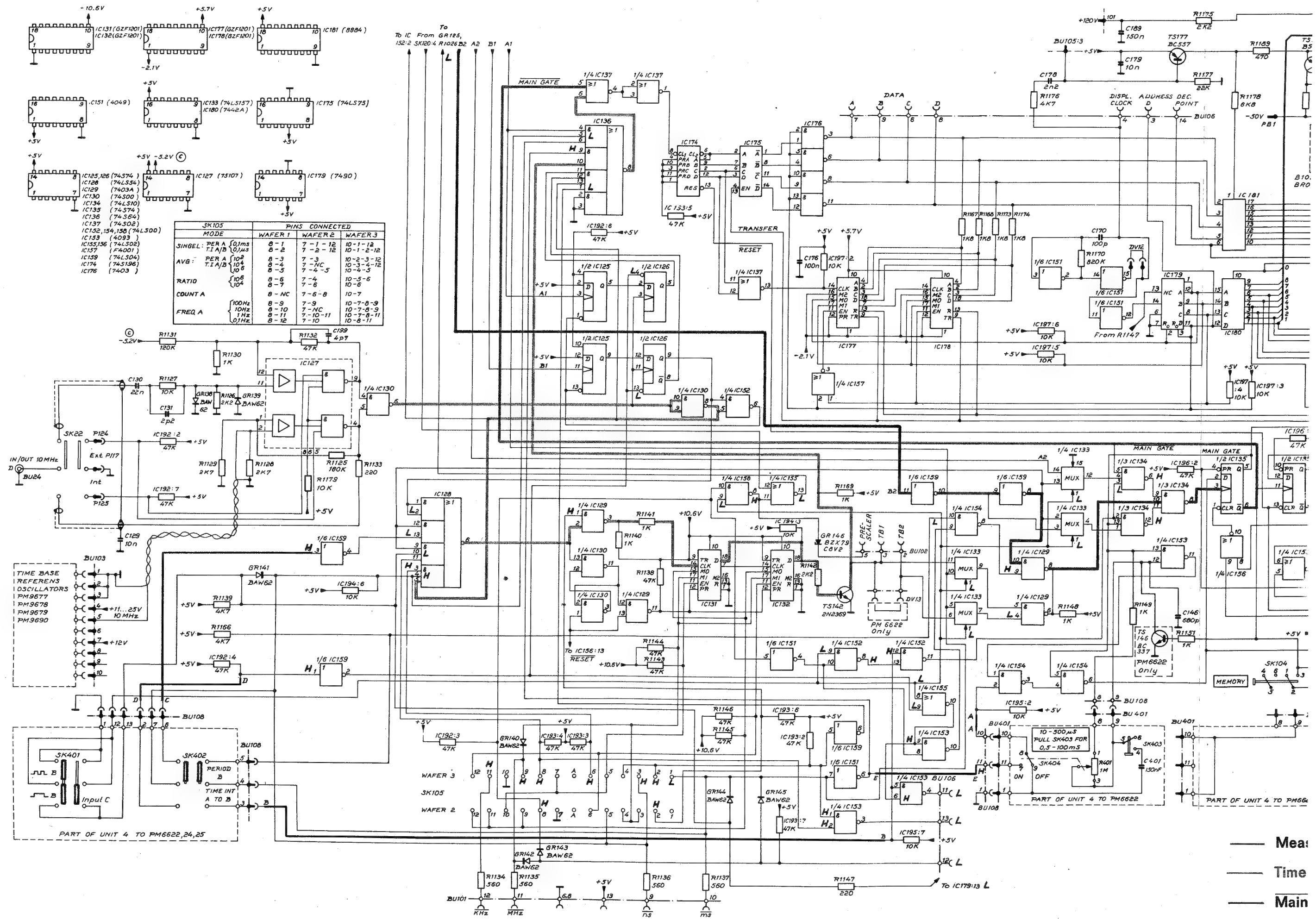


Frequency A

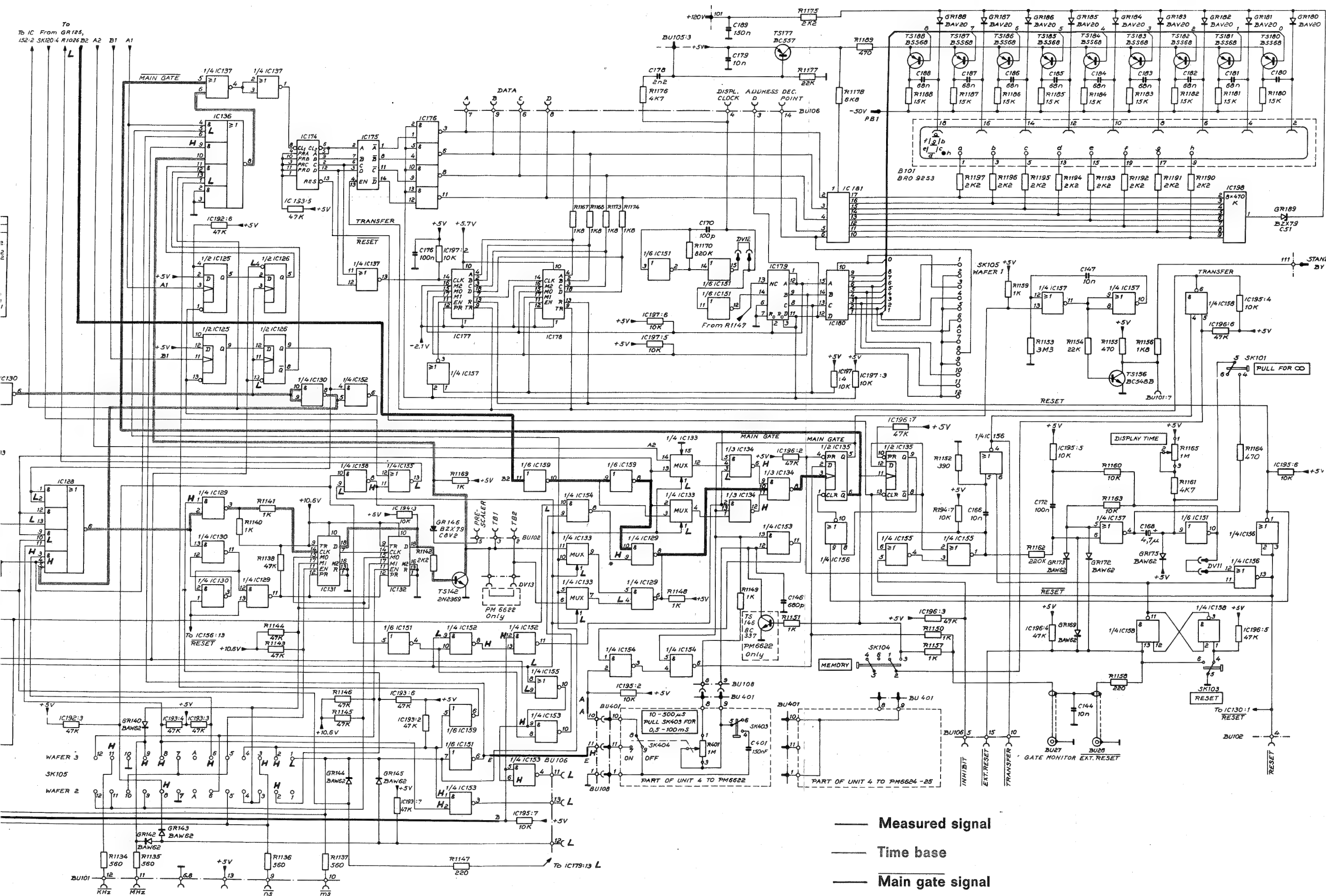




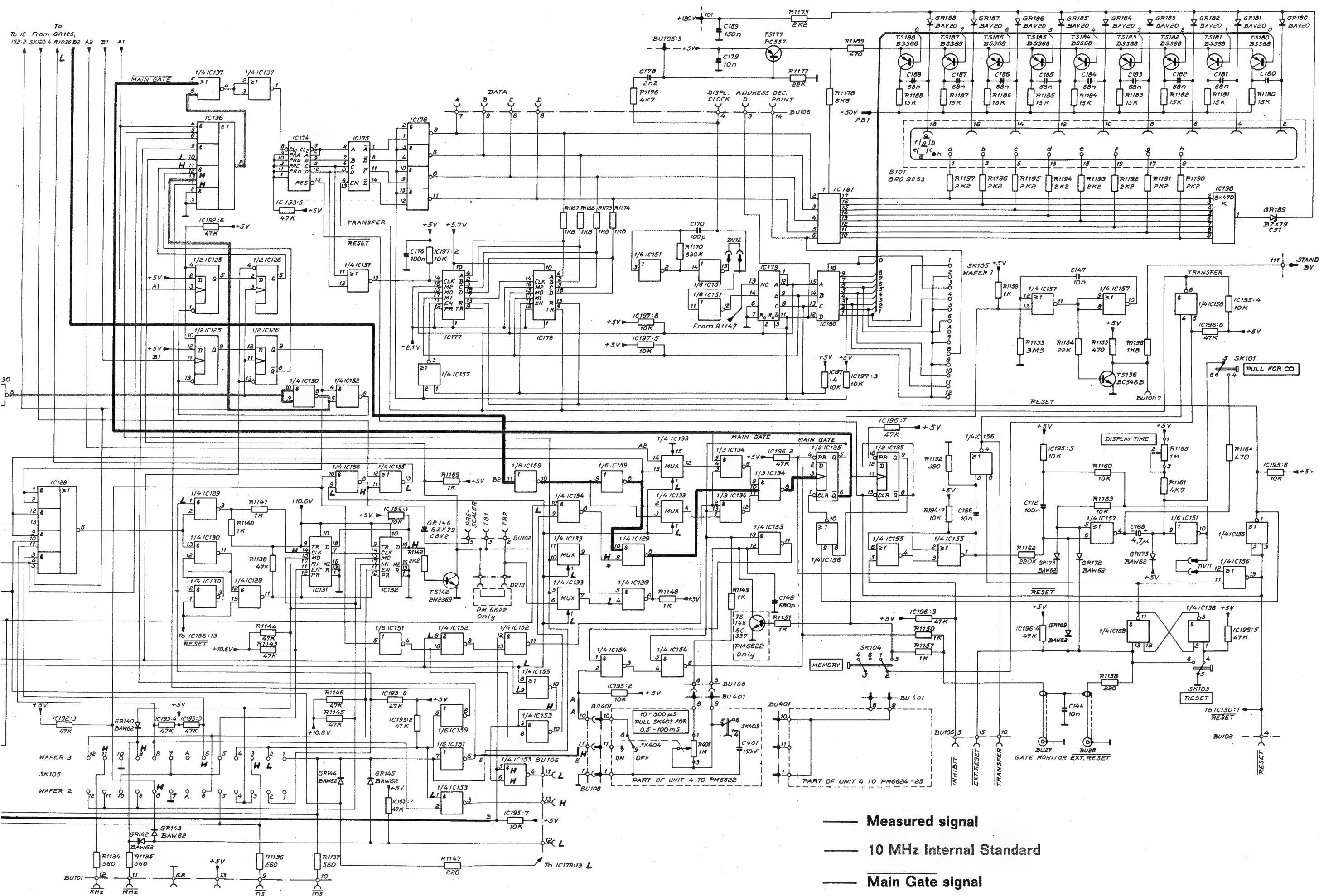


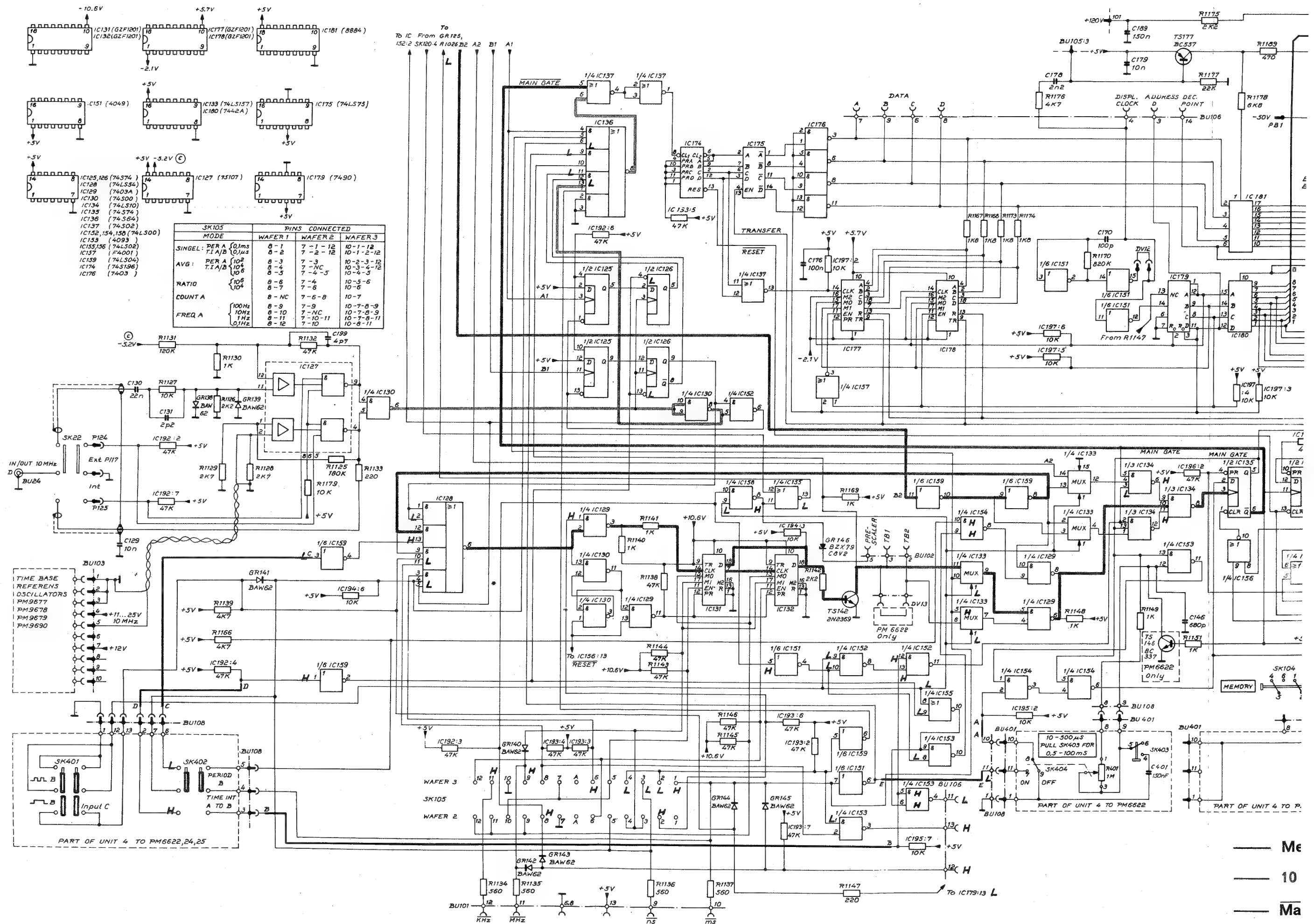


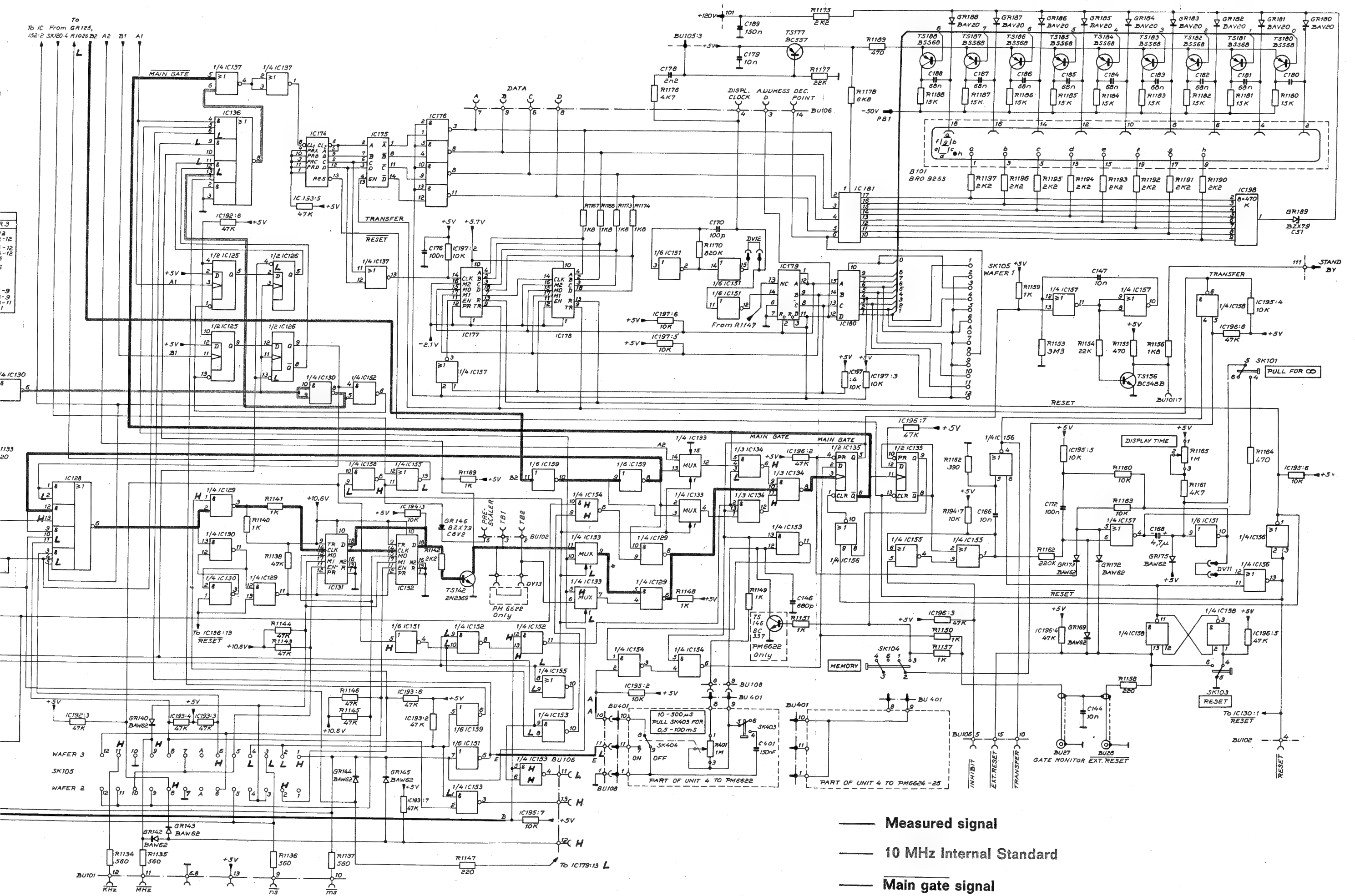
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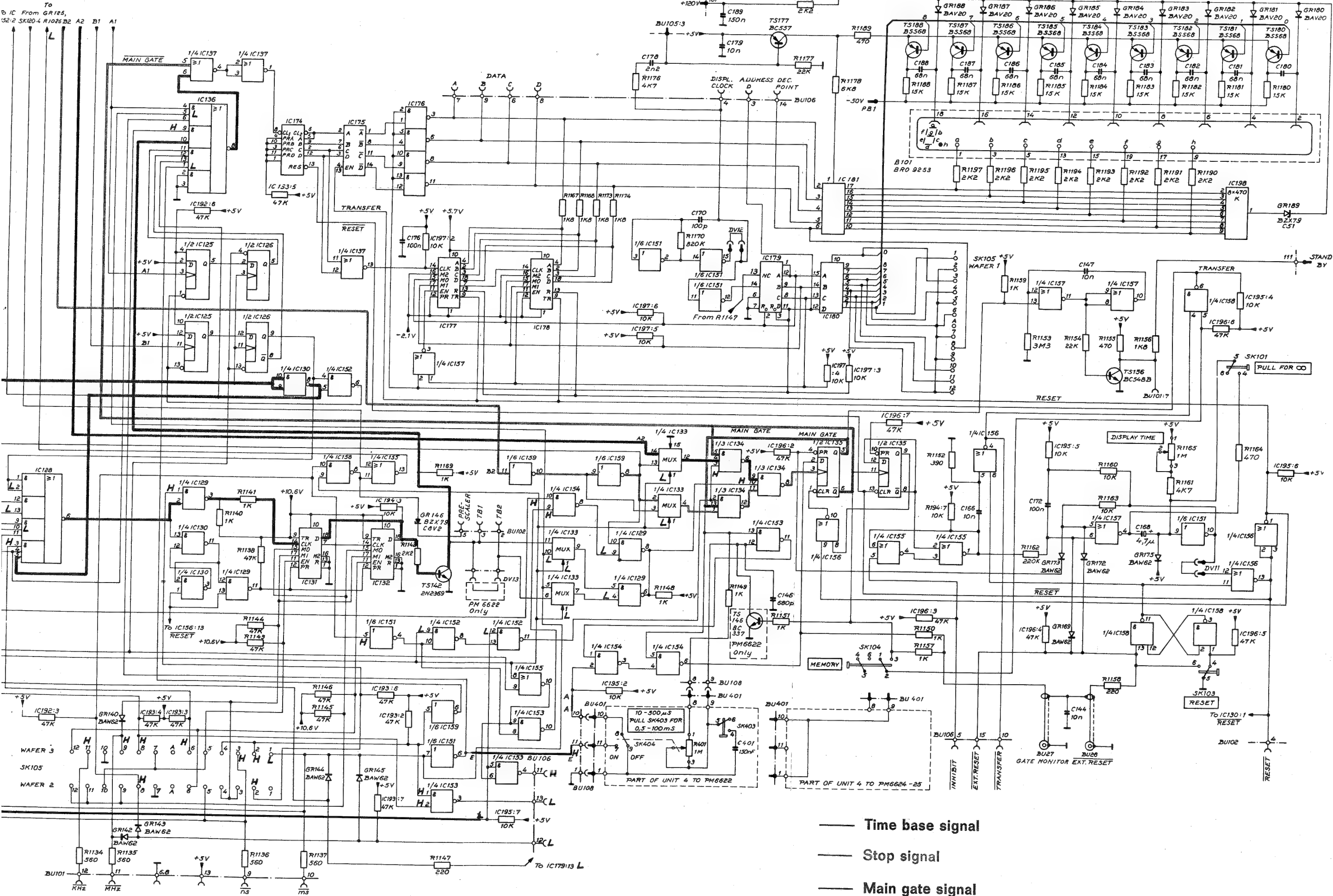
Period B 0.1 μ s

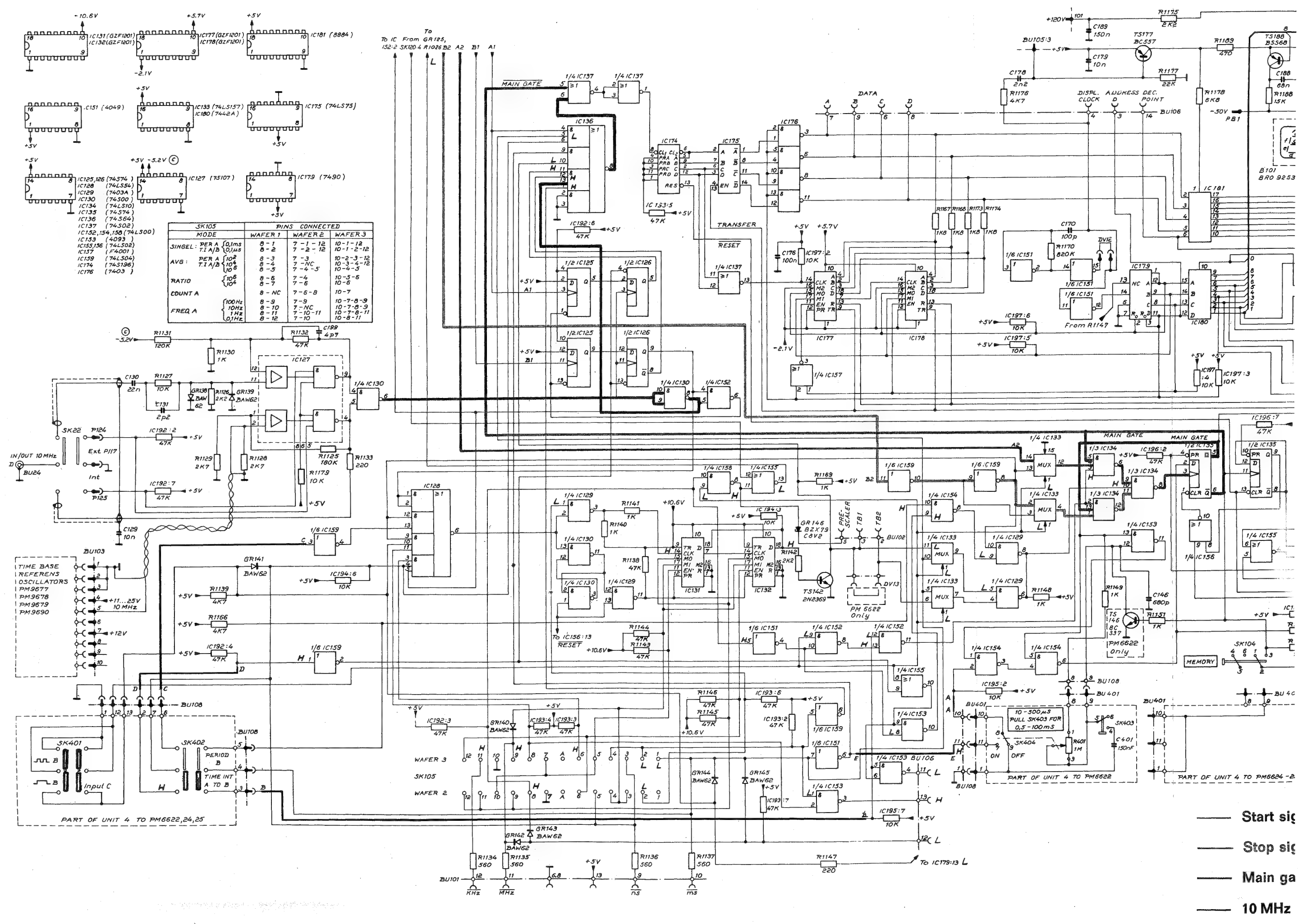




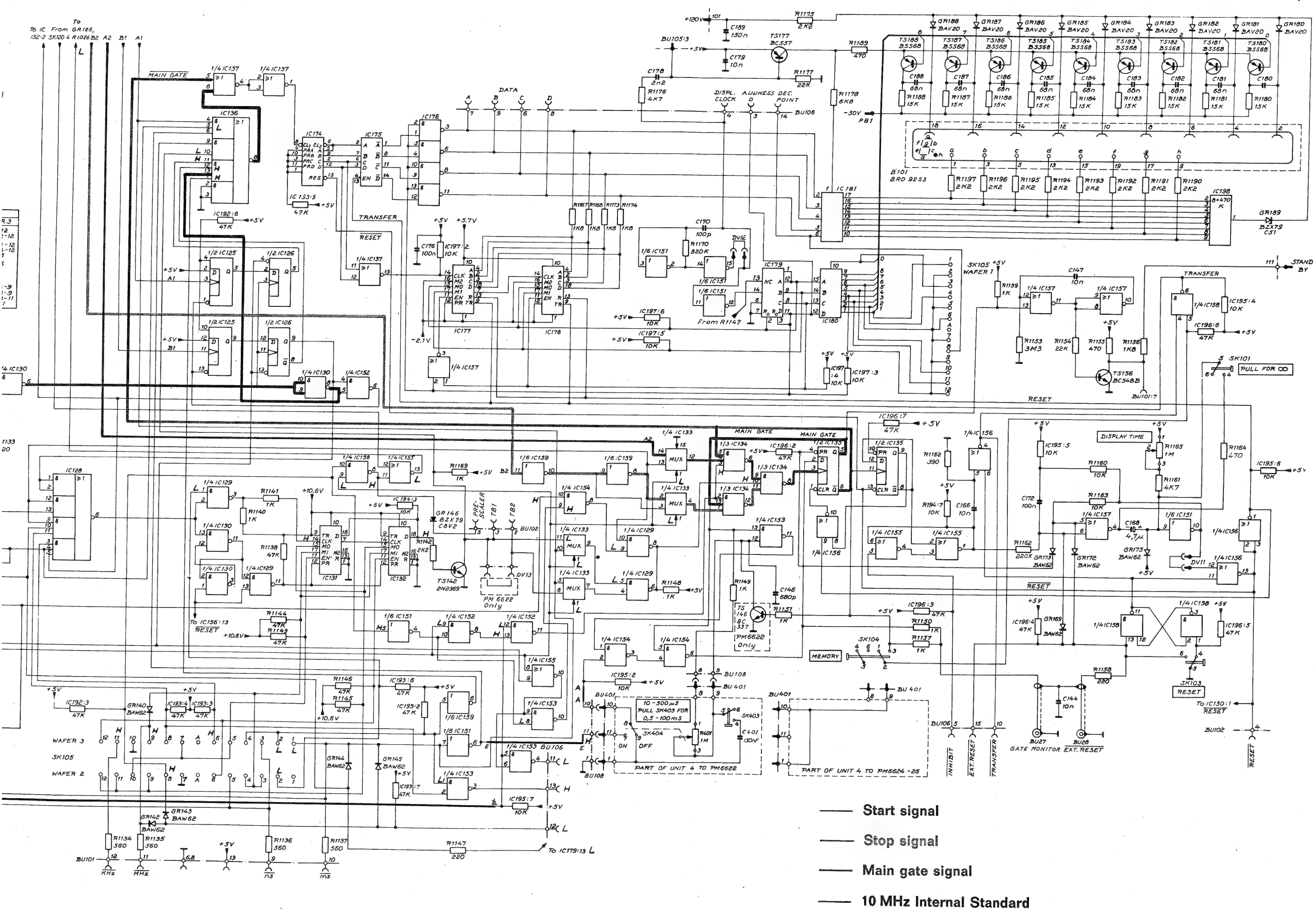


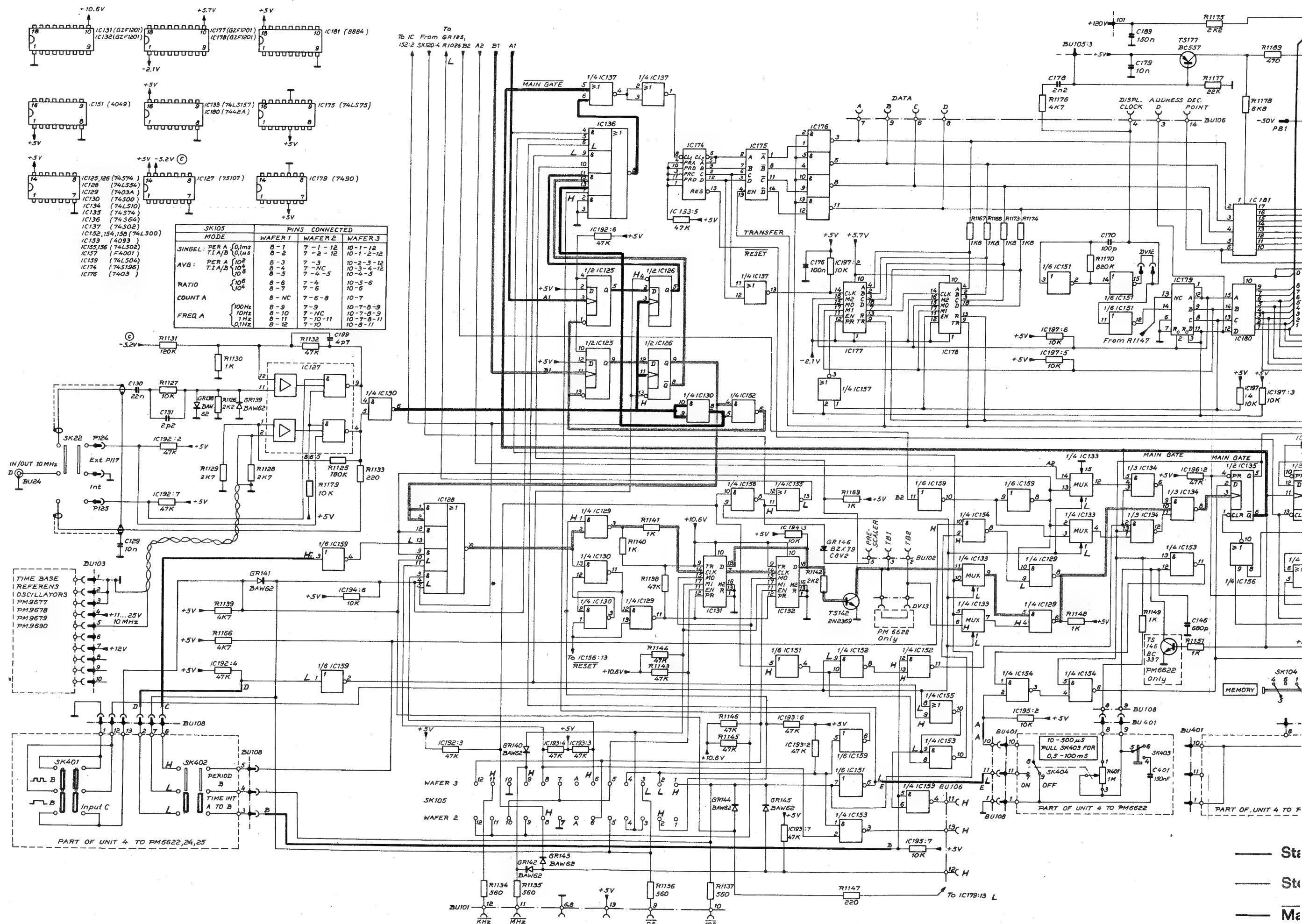
Time Interval 0.1 ms





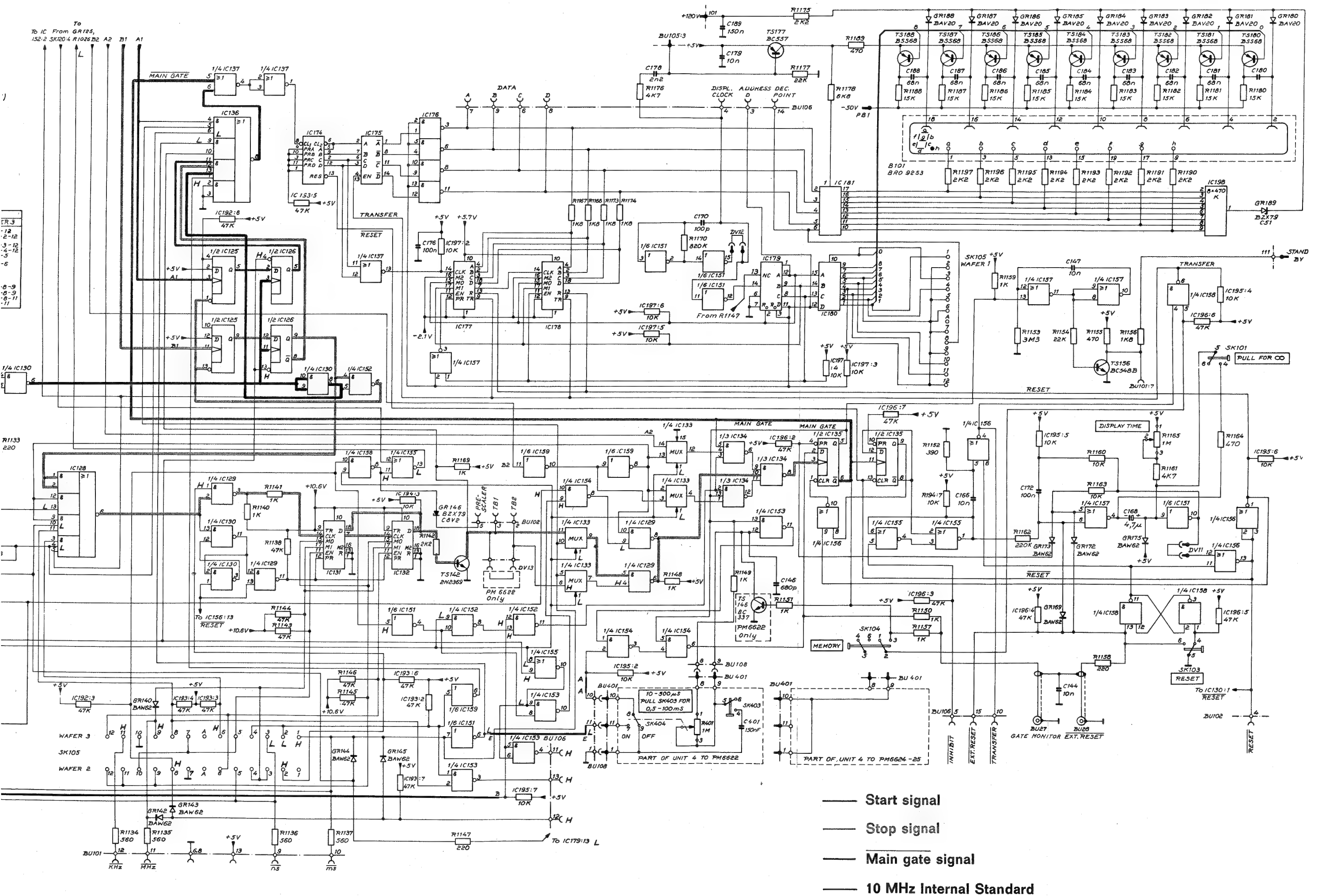
Time Interval 0.1 μ s

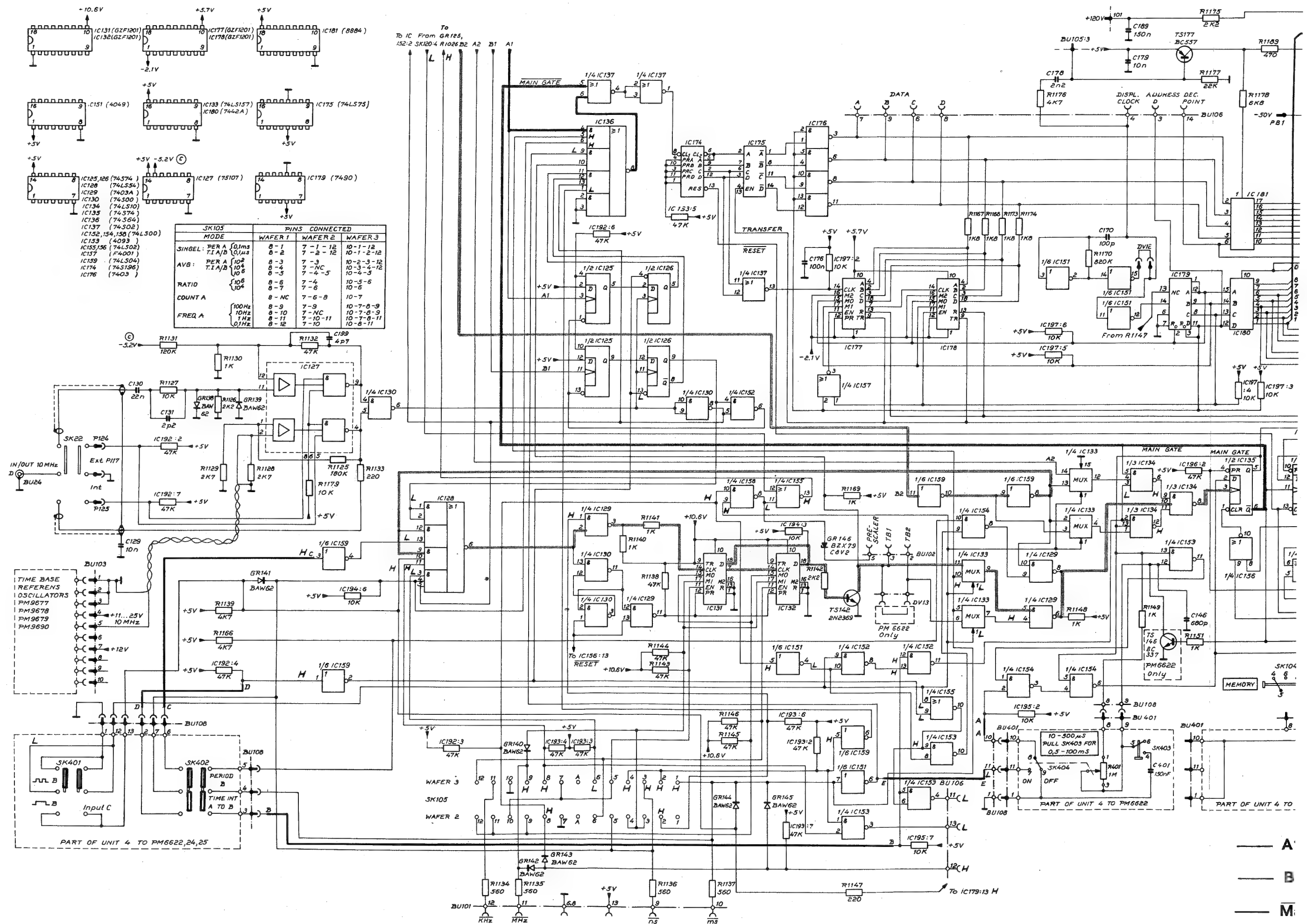


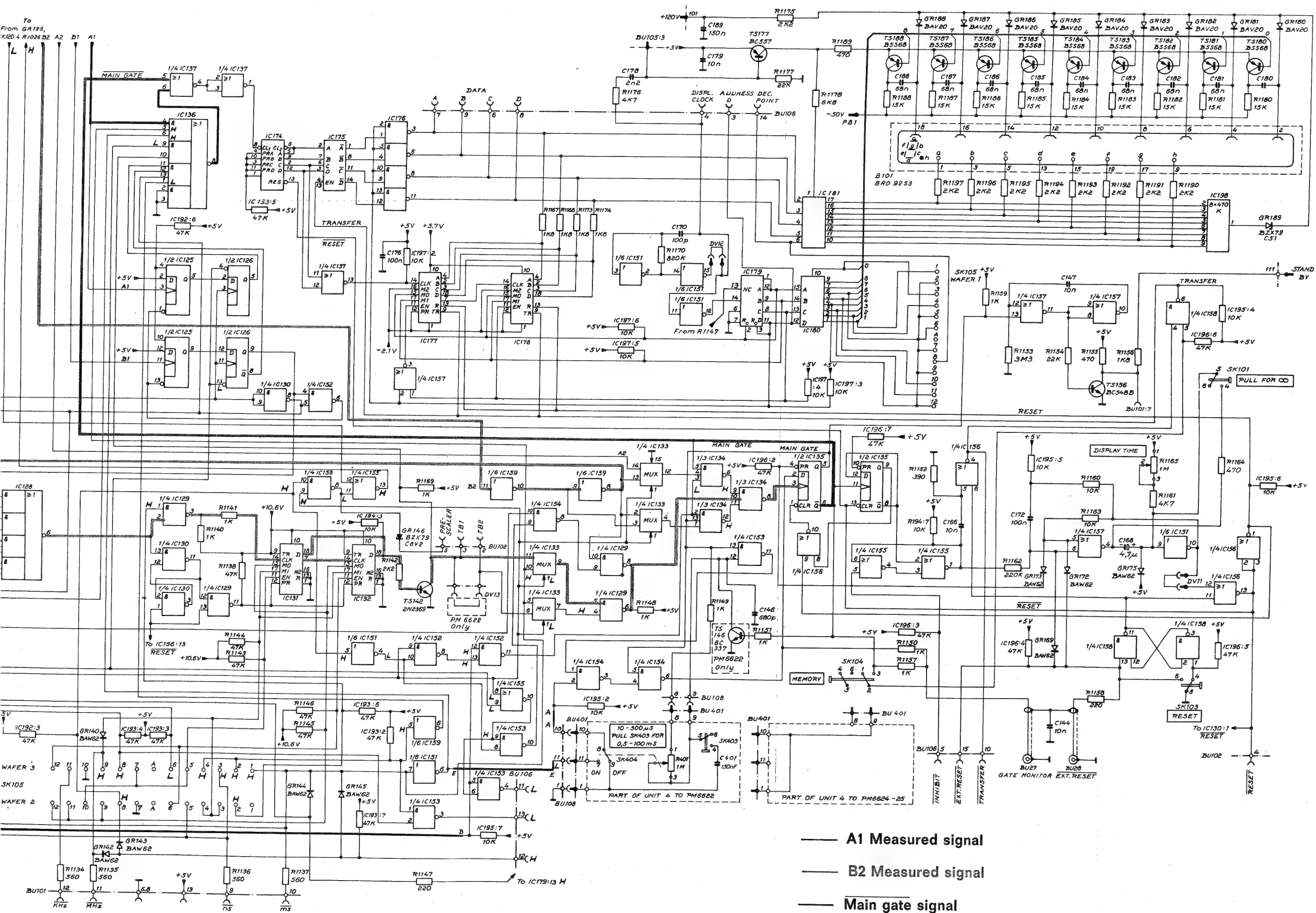


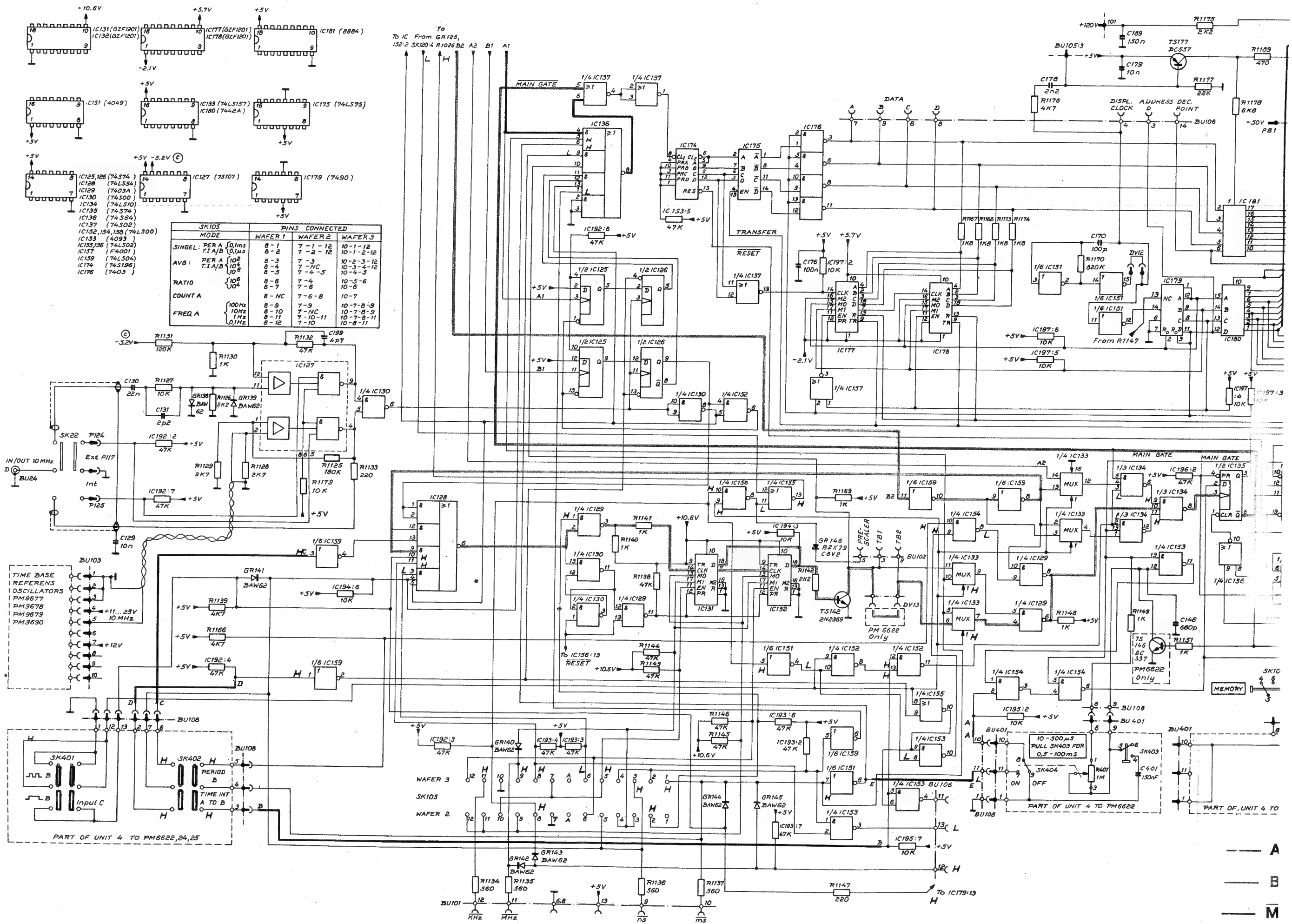
— Str
— Str
— Me
— 10

Time Interval average A to B

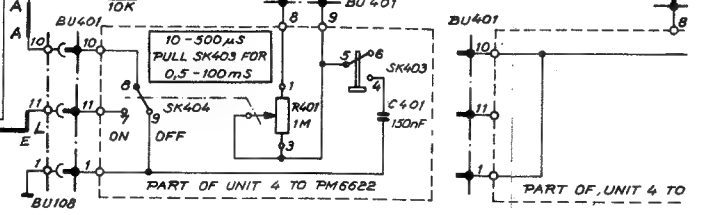
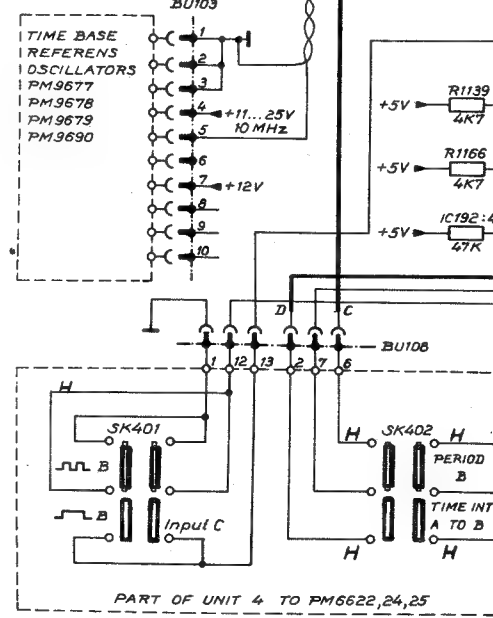




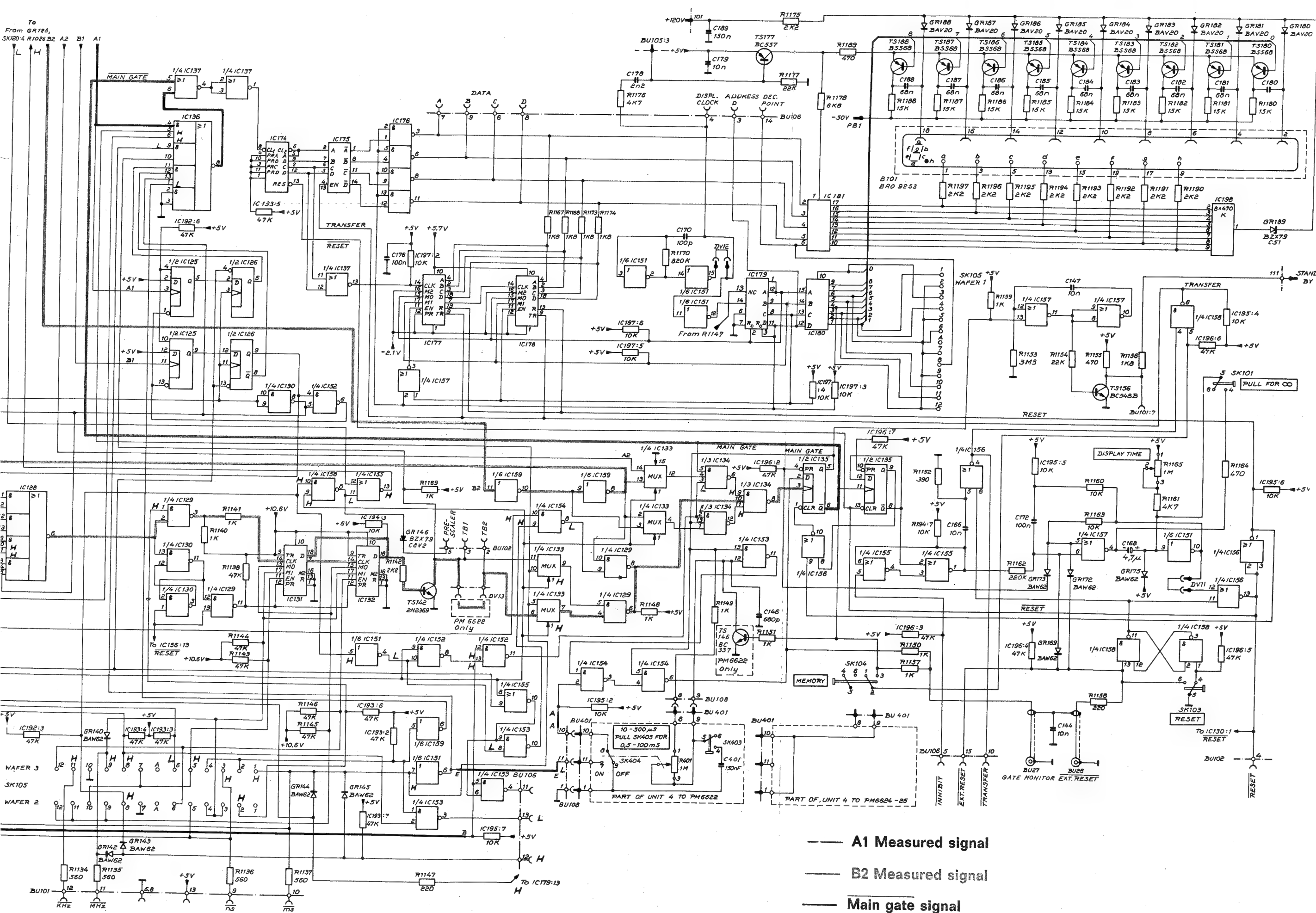




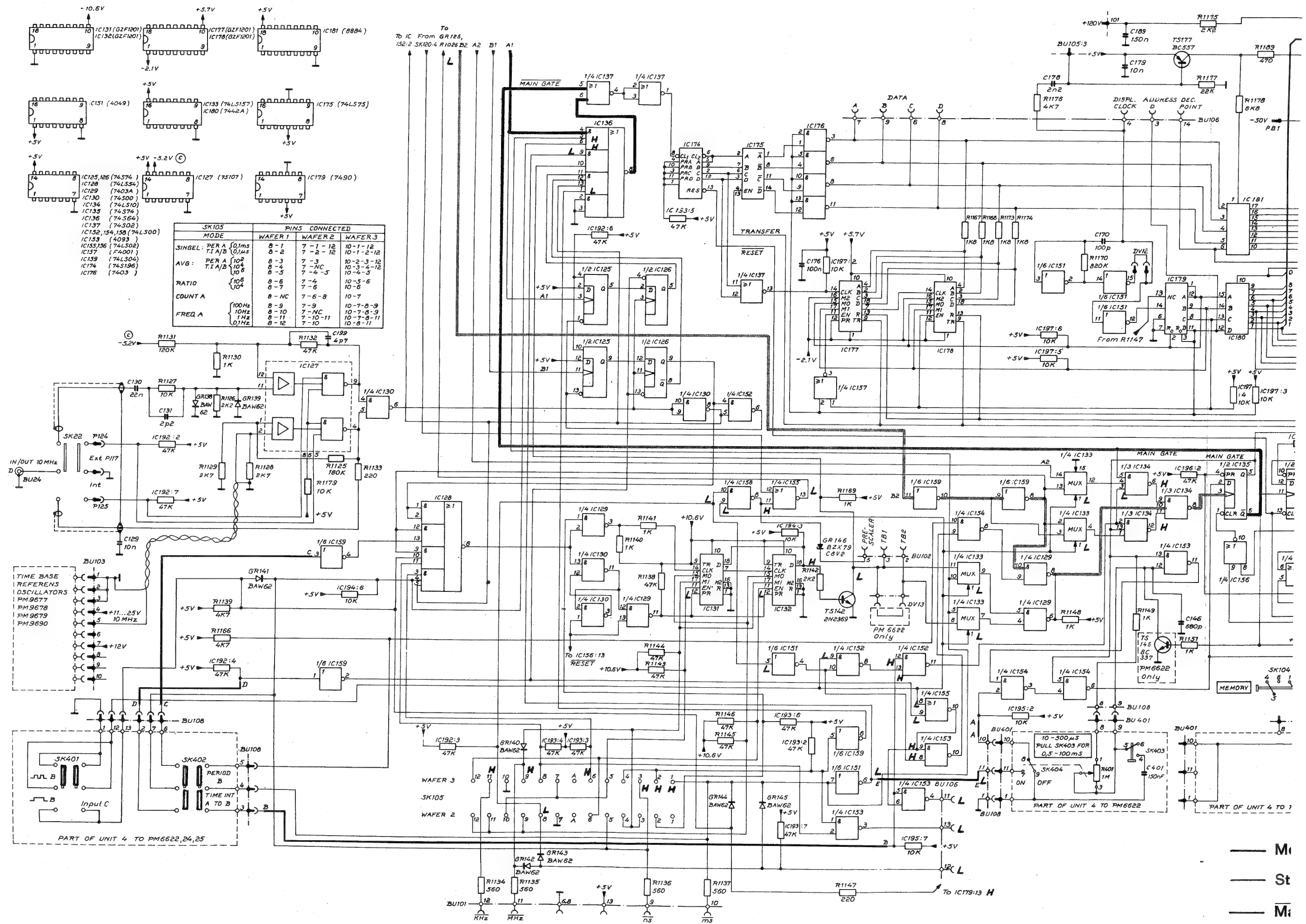
| SK105 MODE | PINS CONNECTED | | |
|--------------------|----------------|---------|-----------|
| | WAFER 1 | WAFER 2 | WAFER 3 |
| SINGEL: PER A 10ms | 8-1 | 7-1-12 | 10-1-12 |
| T.I.A/B 0.1ms | 8-2 | 7-2-12 | 10-1-2-12 |
| AVB: PER A 10s | 8-3 | 7-3 | 10-2-3-12 |
| T.I.A/B 10s | 8-4 | 7-NC | 10-3-4-12 |
| 8-5 | 7-4-5 | 10-4-5 | |
| RATIO 10s | 8-6 | 7-4 | 10-5-6 |
| 10s | 8-7 | 7-6 | 10-6 |
| COUNT A | 8-NC | 7-6-8 | 10-7 |
| FREQ A 100Hz | 8-9 | 7-9 | 10-7-8-9 |
| 10Hz | 8-10 | 7-NC | 10-7-8-9 |
| 1Hz | 8-11 | 7-10-11 | 10-7-8-11 |
| 0.1Hz | 8-12 | 7-10 | 10-8-11 |



A
B
M



— A1 Measured signal
— B2 Measured signal
— Main gate signal



Count A Start/Stop by B

